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Engineering News-Record

May 21, 1931

WATER SUPPLY

. . . . Drought, depression, a dearth of financial support for needed improvements and an unusual demand resulting from high summer temperatures have harassed water-works engineers during the past year and a half. In this issue a number of authorities discuss the need for readjustment of long-time planning procedure, made evident by recent experiences. A new set of values is recognized. Perplexing situations, both common and extraordinary, are diagnosed. It is a challenging array of facts and suggestions that is presented . . . .

Lessons From the Drought
J. F. LABOON
Designing for Peak Demand
E. G. MANAHAN
Economics of Long-Time Planning
L. R. HOWSON
Fiscal Planning for Private Systems
V. BERNARD SIEMS
A New Water Supply in Ten Months
MALCOLM PIRNIE and CHARLES F. RUFF
New Water Service Building at Omaha
T. A. LEISEN
Safeguarding Emergency Water Supplies
L. H. ENSLOW
Population Predictions and the 1930 Census
NATHAN B. JACOBS and ARTHUR W. SKILLING
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Contents for May 21, 1931

VOLUME 106, NUMBER 21

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Lessons From the Drought 836
By J. F. LABOON

Safeguarding Emergency Water Supplies 838
By LINN H. ENSLOW

Managua Water-Works Restored by Army Engineers..... 841

A New Water Supply in Ten Months..... 842
By MALCOLM PIRNIE AND CHARLES F. RUFF

Long-Range Planning Essential in Developing Municipalities. 845
By JOHN H. GREGORY

Financing the Privately Owned Water-Works..... 848
By V. BERNARD SIEMS

Acidity and Hardness Difficulties 850
By L. S. MORGAN

Economic Balance in Constructing Extensions 851
By L. R. HOWSON

Checking Past-Population Forecasts 854
By NATHAN B. JACOBS AND ARTHUR W. SKILLING

Limits in Providing for Peak-Load Consumption..... 856
By ELMER G. MANAHAN

Utility Service Building and Equipment..... 858
By THEODORE A. LEISEN

Water Service Demands Preparedness for Emergencies..... 861

Electric Eye Guards Water Supply of Denver..... 865
By D. D. GROSS

Low Water Table Forecasts Small Autumn Streamflow..... 866

Editorial ..... 833 News ..... 867 Equipment 873

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CABLE ADDRESS: "MACHINIST, N. Y."

Published weekly. $5 per year. 25 cents per copy. Entered as second-class matter April 11, 1917, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member A.B.C.
Member A.B.P.

NUMBER OF COPIES PRINTED THIS ISSUE, 31,573

NEW YORK District Office, 285 Madison Avenue
WASHINGTON, National Press Building
CHICAGO, 520 N. Michigan Ave.
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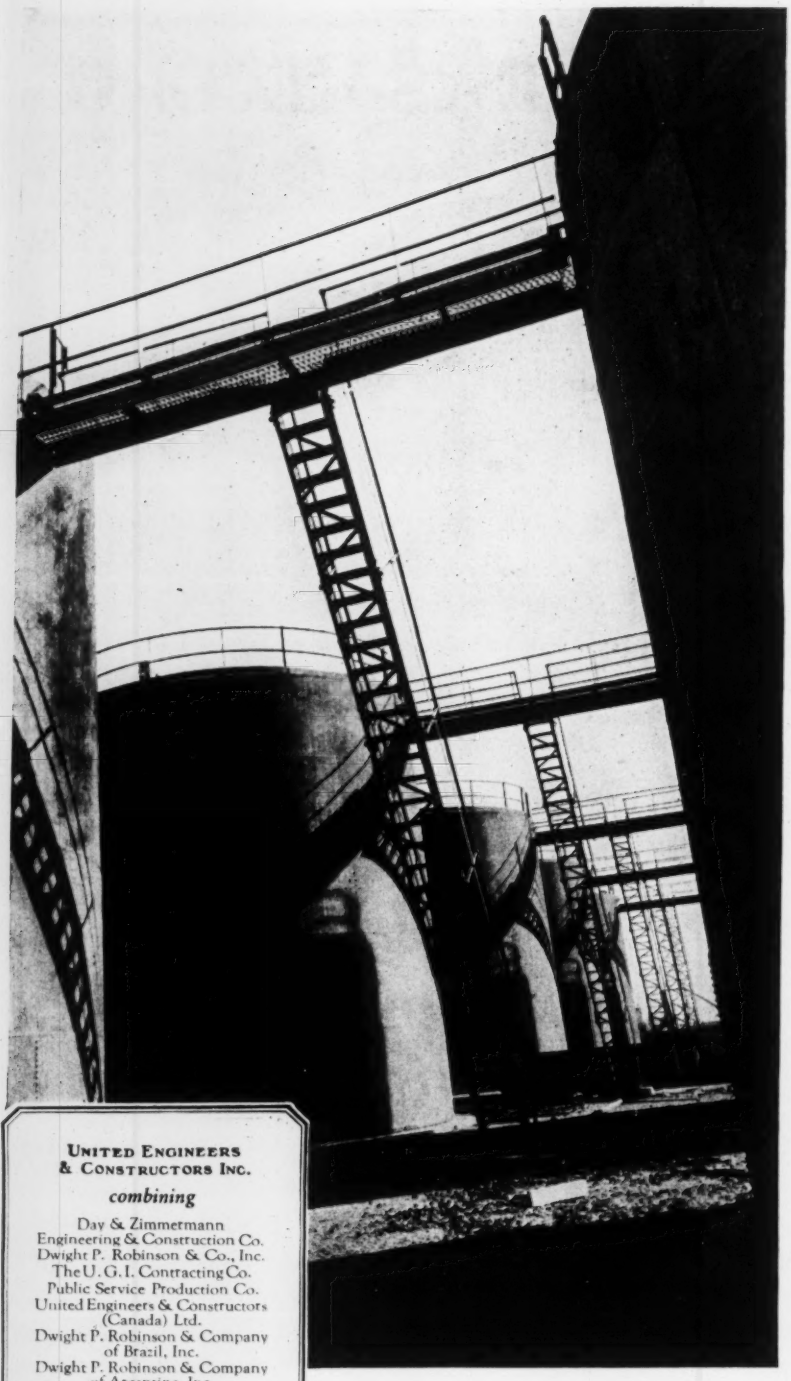

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F. E. SCHMITT, *Editor*

Volume 106 NEW YORK, MAY 21, 1931 Number 21

In This Issue

Water-Works Planning and Management

THE year which has just passed has meant many things to many men, but to those members of the engineering profession concerned with the essential task of supplying water to our cities and towns it will be memorable as the period of the great drought. Unusual and in many cases unprecedented climatic conditions have seriously affected water-supply systems throughout a large and populous section of the country, resulting in many perplexing operating problems and indicating the necessity for a general reconsideration of the adequacy of existing facilities. Nor is the emergency yet over. True, during the last few weeks general rains have relieved the immediate tension over the major part of the affected area, but the accumulated deficiency in precipitation is still alarmingly large. Groundwater levels, fundamental to the yield from underground supplies and the maintenance of dry-season streamflow, have not yet shown any substantial effects.

Regardless of the further course of the hydrologic season, enough has already occurred to justify a critical review of the fundamental assumptions upon which water-works design is based. Operators, too, have learned much under the stern lash of necessity, and this painfully acquired knowledge should not be lost to the profession. Thus the necessity for long-range planning, an established tenet of the water-works industry, is of such timely import that it has been made the central theme of the present issue, which appears on the eve of the fifty-first annual meeting of the American Water Works Association.

PROPER planning in the water-supply field requires a close balance between the amount of water collected and the demand that must be met, both based upon the most unfavorable conditions that can be expected to rule during the life of the project. Since actual measurements of these quantities can be obtained only after construction, when it is difficult or impossible to make any adjustments, the designer of a system must estimate them in accordance with previous experience under similar conditions. It is in this respect that the effects of the drought will be most notable. Already it is evident that accepted figures respecting watershed yields, streamflows and quality characteristics have failed to predict the extreme conditions experienced during the past year. Reexamination in the light of these new data will undoubtedly indicate that many systems are operating upon a much smaller factor of safety than is comfortable or advisable.

Quite unconnected with climatic conditions, but still of material bearing upon the same question, are the figures now available from the 1930 census, which make possible a check upon old population estimates and thus give a revised basis upon which to predict water demand in the future. This opportunity to confirm past estimates should not be neglected.

FAILING supply, the predominating trouble affecting water-works operation in the drought territory, brought in its train a number of difficulties scarcely less serious. Those communities which were forced almost overnight to turn to minor streams, ponds and even mine sumps to supplement their regular supply sources expected some treatment troubles in dealing with such inferior waters. Their worst fears were realized. More disquieting was the unprecedented deterioration of quality in the larger streams, such as the Ohio and Monongahela rivers, where the diminished flow, though still adequate to supply the communities along their banks, showed a marked increase in hardness and acidity, placing extremely heavy loads upon purification works. Along the coast similar causes resulted in increased salinity. Such cases show that even though a community may be fortunate enough to have an ample supply available, drought conditions may cause a severe strain upon facilities well able to cope with normal conditions.

It is gratifying that, despite unusual difficulties, the industry made a creditable record under emergency demand. This is due perhaps to the fact that unexpected troubles calling for immediate and decisive action are an ever-present part of the water-works operator's job. Even in normal years the bursting of a pipe, the failure of an essential piece of apparatus, an excessive fire demand or any of numerous other contingencies may call for instant attention at any hour of the day or night. Such cases, in all well-managed organizations, are handled with efficient dispatch largely because they are prepared for in advance. The lesson of the times is that no city need or ought to be without the organization and equipment to deal effectively with every emergency condition.

LONG-TERM planning, as exemplified by the water-works industry, is receiving a large measure of attention from the business world in general. Present conditions give ample evidence that our haphazard system of production leaves much to be desired, and captains of industry might well study the way in which the complex problem of serving the ever-increasing number of water consumers is handled. Granting the fact that the business of water supply furnishes an ideal field for such foresight, it remains true that a study of the points of simi-

larity and of difference between it and general industry might result in some profitable ideas for the latter.

Of all public utilities, water supply is the most monopolistic in nature. Producers of electricity must compete with gas for lighting and with steam for power; the transportation field is now highly competitive; but the agency furnishing water is alone in its field and there is no competing commodity which can replace its product. The cost of production, being made up largely of fixed charges, is relatively stable and closely predictable for long periods of time. Overproduction does not trouble the business, and the market is definitely limited in area as well as numbers. Future demand can be estimated within close limits, and, while it is true that weather conditions can seriously affect both supply and demand over short periods, limits for such peak loads are being more closely defined as experience widens.

These factors combine to reduce the risk involved in planning for future development. How far the lack of such assurance would keep other enterprises from engaging in long-term planning is a fit subject for discussion. Are the stabilizing characteristics of the water business essential for the application of such planning? If not, how large a deviation from the ideal can be afforded? The water-works industry, in which the long-term view has been the rule for years, can at least serve as a point for departure for those interested in industrial stabilization.

NOTES OF THE WEEK

Engineering Saturation

A LIVE topic of discussion among the civil engineers of California is the possibility of reaching a saturation point in the profession. The state's registration has risen to more than 5,000 professional civil engineers, a ratio of almost one to the thousand of population. This is sufficient reason for the speculation. Under ordinary conditions do the direct and indirect requirements of every thousand of population require the time of a professional civil engineer? The medical calling had an old-fashioned rule of thumb that one physician per thousand is about all the traffic can bear. That was before the day of the specialist and the clinic, and today the tolerable ratio is no doubt higher. Perhaps engineering is emerging into the clinical stage. When a run-down sewage-disposal plant calls for the advice of a foundation expert, a structural diagnostician, a hydraulic consultant on circulation, and finally a sanitary expert to prescribe a change in dosage, the analogy is not beyond reason. Perhaps it is not proper to enter on discussion of an important professional question in this vein; but the knowledge that at least one state has a 1:1,000 ratio between civil engineers and population should provoke critical reflection.

Stable Employment

OUT of the fading memories of the International Chamber of Commerce meeting the thought emerges that the president of the General Electric Co., Gerard Swope, said a great and memorable thing in his argument for industrial regularization of employment. His underlying tenet was that the individual worker's earning power must be protected if we are to have sound and stable industrial life. The expression of this view marks a new epoch in industrial thinking. It means that unemployment, or rather the deprivation of livelihood that attends unemployment, has come to be everybody's business—and primarily the business of industry itself, unless industry were to renounce its claim to be a self-contained and self-regulating entity. No one yet knows how earning power can be stabilized, or whether it is possible. Mr. Swope himself proposed no answer. The General Electric's unemployment insurance system, excellent as it is, cannot claim to be more than an initial attempt at an answer, and even if it were conceded to be adequate for electrical manufacturing it could not be applied to an incoherent and unorganized industry like construction. Yet in the spirit of Mr. Swope's argument, construction as well as electrical manufacturing must face the problem, for an industry, like a fighting army, travels on its belly and will fail unless it can keep its troops fed. Study of this industrial problem is one of the first duties of every industry group or association. Few, if any, have yet given it thought.

Locking Stable Doors

FIRE'S chance of bringing disaster to human works has been lessened by long years of labor of the kind done by the National Fire Protection Association, whose meeting last week contributed further to the campaign of progress. But one important function of such a meeting is to serve as reminder of the hazards that can never be eliminated otherwise than by care and vigilance. Thus, a terrible fire that occurred in the Ohio penitentiary at Columbus last year revealed conditions of startling character, and there followed extensive investigations of fire-hazard conditions in other penal institutions throughout the country. Similar investigations have followed individual theater fires, schoolhouse fires, construction accidents, epidemics and other tragic occurrences. All such investigations bring to light many examples of neglected dangerous conditions, and some of these are likely to be remedied. But the warning or lesson of the original disaster is too soon forgotten. Time is consumed in making the investigation, in preparing reports and plans, in holding meetings of authorities, in trying to harmonize diverse opinions or adverse interests, in devising means for raising funds. Meanwhile, other matters engage public attention; indignation wanes, and usually the outcome is that little or nothing is done for the protection of life or property at places where dangers are known to exist. Sporadic attention to fire dangers serves little practical purpose—usually it does no more than to lock a stable door too late. Only systematic vigilance, by regular examinations and prompt corrective action, will yield practical results in controlling unnecessary hazards.

Separate Contracts for Steel

STEEL fabricators in New Jersey are celebrating as a victory the enactment of a law that requires all steel contracts on state work to be made direct with the state authorities. Thus the steel fabricator is assured a fair price for his products, and the general contractor, the real cause of all the steel fabricator's worries, is deprived of the privilege of exploiting him. That, at least, is the theory. If history repeats itself, however, actual developments may be somewhat different. One has only to consider the cement industry to obtain a picture of the working of the separate contract arrangement in so far as contract prices are concerned. When cement manufac-

turers achieved their independence from the general contractor and went to work for the owner—in this instance the state highway department—they too visioned a bright future. But they found the owner quite as capable of bargaining for a low price as was the general contractor. To be sure, he operated somewhat differently—namely, by throwing out all bids and calling for new ones instead of personally conducting a price-cutting war among the several bidders. But the result was the same—the contract often was awarded for less than cost. It is hard, therefore, to be optimistic with the steel fabricators over their victory. One can sympathize with their feelings toward some general contractors who seek to increase their general-manager fee by striking sharp bargains with their subcontractors. But merely substituting the owner for the general contractor is not a general panacea for the subcontractor's ills. Fair prices will be received only when the subcontractors display enough backbone to refuse to bid below cost.

Boulder Dam Act Valid

DISMISSAL by the United States Supreme Court of the Arizona suit on the validity of the Boulder Dam act removes the last remaining threat to the project that is to build a greater Southwest. The uncertainty created by the suit had raised a distinct cloud on the construction horizon, removal of which leaves an encouraging brightness. The Southwest is just beginning to hum with activity, and the decision means that no interruption of this activity need be feared.

Arizona's rights have not been infringed, and the Boulder Dam act is valid, says the Supreme Court. "The act does not purport to affect any legal right of the state, or to limit in any way the exercise of its legal right to appropriate any of the unappropriated 9,000,000 acre-feet which may flow within or on its borders," says Justice Brandeis in his opinion. It may be concluded from his finding that the existence and continuance of Arizona's rights does not weaken the power of the other states to pool and reallocate their water claims, or the power of the United States to act in accordance with this reallocation so far as these six states are concerned.

Of the many purposes advanced to justify the action of the United States in building the project, Justice Brandeis uses the purpose of navigation improvement as basis for his decision that the Act is valid. He finds that the river has been navigable in fact and that therefore an enterprise to improve its navigability is a lawful object of federal construction. Therefore the court does not stop to inquire into other purposes: to irrigate public lands, to regulate the river, to prevent floods, or to conserve and apportion its waters. But there is at least an intimation that such purposes in themselves might have prevailed.

However extensive in its effects, the decision establishes no new principle of water rights or water law. On the contrary, it reaffirms existing law. In future as well as hitherto, rights to water rest on appropriation to beneficial use, in accordance with the doctrine of law established almost universally in the arid states for generations past. But in its bearing on state cooperation the decision is important because it strengthens the case for reasonable, peaceful interstate agreement, and weakens the power of minority obstruction.

The recent decisions of the Supreme Court in Connecticut River and Delaware River cases were directed against the assumption that one partner in an interstate resource may stop all utilization of that resource except on terms that it might dictate. The Colorado River decision strengthens this newly established and far-reaching principle by rejecting similar claims to limitless veto power. It does not lessen state autonomy and sovereignty, but it implies that state power may not be used to limit the power of other states and the people at large to utilize their rights. It thus further clarifies and simplifies principles governing the use of joint resources.

Still a Long Way Off

NEW YORK STATE'S project for the development of power in the international section of the St. Lawrence River is launched officially with the naming of the five trustees who are to make up the Power Authority. In January of this year the state's St. Lawrence River Power Development Commission, after several months' study if the problem, recommended that New York State and the Province of Ontario join in the construction on the river of a power plant to develop 660,000 hp. initially and 2,200,000 hp. ultimately, New York's part of the work to be financed and built by a corporate municipal instrumentality to be known as the Power Authority, consisting of five trustees.

Launching the project does not, however, mean that dirt will begin to fly along the international section of the St. Lawrence. Nothing can be done without the consent of Canada. The engineers of the Ontario Hydro-Electric Power Commission must be convinced that New York's single-stage scheme is better than their two-stage scheme, and then the Ontario commission must find a market for its share of the power in excess of its present commitments to purchase power from Quebec. Approval of the plans for power and navigation must be obtained from the federal governments on both sides of the line, and from such bodies as the International Joint Commission, the War Department and the Federal Power Commission. Doubtless a formal treaty will be required before all the details are settled. Finally, before work may start the Power Authority must enter into a contract for the sale of its power, presumably to the Niagara-Hudson system, the only near-by system capable of absorbing New York's share of the power.

Failure of the Power Authority to reach any one of these three objectives will mean the failure of the whole undertaking. National and international problems are involved in getting authorizations and agreements which will make it possible for the forces of the Power Authority to enter the river to start construction. Such matters as the jurisdiction of the Federal Power Commission over a power project on an international stream and the possible surrender by the state of sovereign rights to the federal government through an application to the commission for a permit are bound to come up, as is the highly controversial question of the St. Lawrence shipway. A quite different but equally delicate problem is involved in the negotiation of the power contract because the law setting up the Power Authority specifies that the contract must include some unusual conditions as to rates and regulation. None of these matters can be settled in a day. Months, if not years, must be spent in pressing them to a successful conclusion. Under the most auspicious circumstances it will be nearly a decade before turbines begin to hum along the upper St. Lawrence.

Lessons From the 1930 Drought

Basic Design Assumptions Must Be Revised

By J. F. LABOON,
Consulting Engineer, The J. N. Chester Engineers, Pittsburgh, Pa.

Zero yields, high maximum-average consumption ratios and quality depreciation main factors affecting water service in times of shortage

THE abnormal rainfall and streamflow conditions of 1930 presented a difficult test to water-works systems throughout a large area. Supplies designed to be safe under assumed limiting conditions of low water and high demand were given an opportunity to prove their adequacy. From their experiences a valuable lesson can be learned. In the following article Mr. Laboon summarizes the experiences of a number of water systems and points out the revisions that are needed in our basic design data. —EDITOR.

IN THE LIGHT of the experience of water-works engineers during the drought of 1930 it appears necessary to revise basic design assumptions as to the quantity of water available from any supply source, the consumption demand to be expected and the possible variations in quality of the water selected for use. New records have been set for low rainfall and minimum streamflows, while peak demands in many cities have been higher than ever before. In addition, numerous supplies, not in danger of depletion, presented difficult treatment problems because of the increase in taste-producing or hardness-forming compounds. Lack of meters and low water rates to large consumers were shown to be important factors in allowing high demands on the water-works system during a time when conservation of supply was desirable.

The drought is not yet a matter of history, for many impounding reservoirs still are dangerously low. Rainfall in the Pittsburgh district for the first four months of 1930 was 20 per cent deficient, compared with a deficiency of but 12 per cent for the corresponding months of 1929. One reservoir supply in Pennsylvania impounding three billion gallons went dry as recently as January of this year, and several other reservoirs in the same district are only partly full now, whereas ordinarily at this season they are overflowing.

Rainfall measured at the weather bureau in Pittsburgh was found to be 37 per cent deficient for the year 1930, a record at this station. West Virginia registered a deficiency of 21 per cent for the same period, and many other states have a similar record. The mean temperature at Pittsburgh for 1930 was but ½ deg. higher than normal, so it may be said that this factor had very little influence on the drought. The engineer must finally come back to rainfall for his study of streams and reservoirs.

It is too soon to obtain a complete record of streamflows for 1930, as most of the various state agencies are too busy preparing the publication of the records of 1928 and 1929. A study of four Pennsylvania streams and the Cheat River in West Virginia, however, offers some data in the matter of minimum flows. In the accompanying chart, Fig. 1, the monthly discharges for these streams during 1930 are shown. It will be noted that the runoff per unit area of watershed streams varied widely between October, 1929, and January, 1930, but that beginning with February, 1930, the runoff of Brandywine Creek, Conestoga Creek and the Schuylkill River were remarkably similar in value and character, whereas that of Perkiomen Creek was more flashy and somewhat similar to the Cheat River in West Virginia. The Cheat River behavior was characteristic of the streams throughout West Virginia and southwestern Pennsylvania.

Minimum flows for one day were registered as follows, in second-feet per square mile:

Perkiomen Creek in August	0.026
Brandywine Creek in October	0.202
Schuylkill River in August	0.066
Cheat River in September	0.015

Heretofore, engineers in estimating stream runoff in the eastern United States, have assumed minimum runoff values of 0.07 sec.-ft., and more recently as low as 0.04 sec.-ft. per square mile, but now some streams have been found to have zero values. Furthermore, it has been considered good practice to use a value of 0.5 million gallons per day as the safe yield of a completely impounded stream, but now to be safe this value must be reduced to at least 0.4 m.g.d. Additional streamflow data will make possible more accurate calculations of yields.

The drought, in addition to emphasizing the weak spots

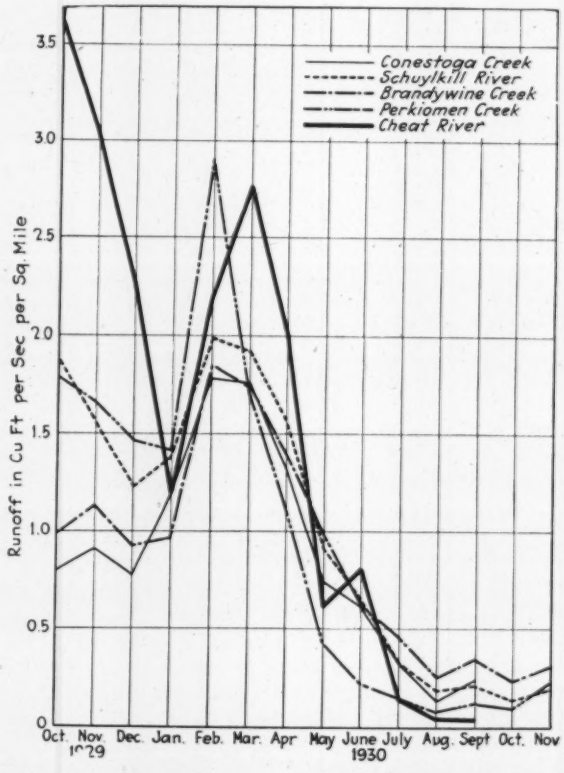


Fig. 1—Stream discharges fell to new low figures in 1930

MAXIMUM AND MINIMUM DAILY CONSUMPTION IN SEVEN CITIES

City	Population 1920	Population 1930	Increase, Per Cent	Per Cent Metered	Distribution Reservoir Capacity, M. G.	Clear-Water Storage, M. G.	One Day Consumption in Per Cent of Yearly Average — 1928 Max.	1928 Min.	1929 Max.	1929 Min.	1930 Max.	1930 Min.
Pittsburgh, Pa.....	588,343	669,817	13.8	40	429	50	Jan., 125	Aug., 72	Jan., 119	Oct., 85	Jan., 122	Sept., 79
Nashville, Tenn.....	118,342	153,153	29.4	100	54	1	Aug., 129	Dec., 75	July, 131	April, 75	July, 139	Nov., 70
Erie, Pa.....	93,372	115,967	24.2	5	35	2	Aug., 129	July, 74	June, 137	Mar., 75	July, 137	Dec., 73
Shreveport, La.....	43,874	76,659	74.7	100	0	4	Aug., 157	Mar., 65	Sept., 143	Jan., 65	July, 187	Oct., 70
Wheeling, W. Va....	56,208	61,659	9.7	53	8	1	Aug., 123	April, 73	Sept., 124	Nov., 65	Aug., 153	Dec., 65
Lancaster, Pa.....	53,150	59,949	12.8	100	7	2	Aug., 124	Dec., 73	July, 131	Nov., 75	Aug., 124	Jan., 59
Bowling Green, Ky.	9,638	12,340	28	15	2	..	.....	.....	July, 139	Sept., 56	July, 172	Oct., 70

in supply works, also showed weaknesses in purification works, pumping stations and distribution facilities. Most supplies in the drought area were forced to measures of conservation during the past year. Maximum and minimum daily consumption for the years 1928, 1929 and 1930 are shown in the accompanying table for seven municipal water systems to illustrate the effect of the drought on demand. It is interesting to note that, of the seven cities Pittsburgh, Wheeling, Bowling Green and Shreveport did not restrict consumption during the drought in any respect, while the three remaining cities did. Nashville installed washer-shaped orifices in the meter connections to prevent sprinkling. The other two cities instituted strict disciplinary measures to conserve water.

Pittsburgh, with but 40 per cent of its services metered, had its 1930 maximum daily consumption in January as in previous years, due to running faucets to prevent freezing. Wheeling, with 53 per cent metered services, had a maximum day in August of 153 per cent of the average for the year. Bowling Green, Ky., has a small supply, practically unmetered. A maximum-day consumption of 172 per cent of the average yearly demand occurred in July. Shreveport, with no reservoirs on the distribution system, suffered at the output works, but its twenty-billion-gallon impounded supply was a real backbone. Reservoir storage in the distribution system played an important part in permitting high consumption peaks, while limited storage on the distribution system made output works of large capacity necessary to meet the peak demands. A graph of daily averages for each month of 1928, 1929 and 1930 in terms of the yearly average rate for six of the cities is shown in Fig. 2.

Other important factors in determining demands and their peaks are meters and water rates. The experiences of 1930 will give impetus to metering in many quarters, but the matter of establishing proper rates for large consumers is not likely to receive the attention it deserves. Pittsburgh is an example of an industrial city that makes a charge of 14c. per 1,000 gal. to large consumers and has not had to increase its filtration plant since its installation 25 years ago. Erie is an industrial city making a low charge to large consumers, 4c. per 1,000 gal., and is now installing additional works to give the water department a rated output capacity of 48 m.g.d., with some elements capable of producing 102 m.g.d. A few months ago a city of 23,000, on completion of its 8-m.g.d. filtration plant (designed when the average yearly consumption was 5 m.g.d.) permitted paper plants to draw on the filtered water supply at a rate of 3½c. Consumption demand now averages more than 10 m.g.d. In that plant it is necessary to pump raw water 14 miles to the filters.

Fig. 2—Depleted reservoir at Centralia, Ill., February, 1931
The high-water mark is visible on the intake tower.

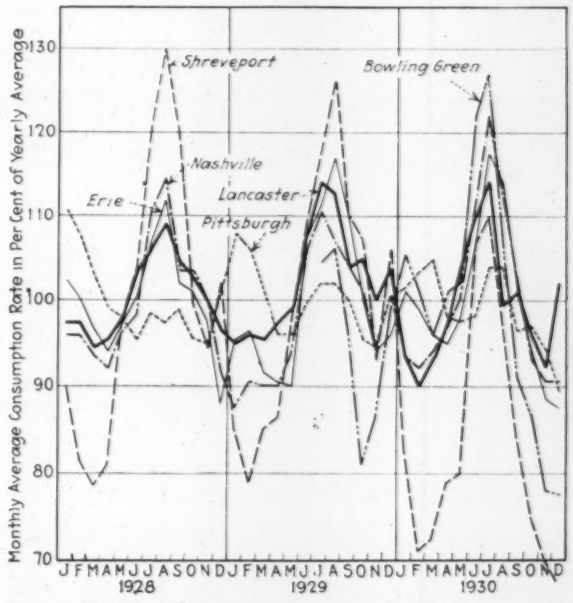


Fig. 3—Monthly variation in demand shows effects of drought

The drought has served to bring out the seriousness of tastes and odors arising from industrial wastes and sewage entering streams during long periods of low flow. Many supplies of ample capacity to meet extreme consumption demands were forced to serve unpalatable water. On the Ohio and Monongahela rivers pools above the locks became highly polluted with trade wastes and there was little flow to flush them out. These pools acted as settling basins, and the first flush from a rain relieved the condition only temporarily.

Many water supplies, ordinarily of satisfactory quality as to hardness, became so hard as to cause general complaint. As a result, softening plants are now being considered necessary adjuncts of the water-works, and some softening plants that had been operating as filtration plants only because of cost were forced to resume softening treatment.

Ammonia, activated carbon and potassium permanganate were used to correct tastes and odors. Much has been learned of the use of these materials in the elimination of tastes due to chlorination and trade wastes. Every

water-works using chlorine in any form must now give consideration to the employment of auxiliary taste-removal treatment. Likewise, aeration is worthy of consideration in new treatment works, especially those having to treat impounded supplies. Furthermore, the experiences of 1930 should give an impetus to sewage-treatment projects so as to prevent a repetition of such high degrees of pollution.

The lesson to be learned from the drought has many phases of special interest to engineers, but it is too recent to permit a complete development at present. However, sufficient data have been collected to warrant the opinion that yardstick standards of previous years must be scaled down and that more attention must be given to metering, municipal water rates, adequate design of plants, production of palatable water and the reduction of pollution by trade wastes and sewage in streams used for water supply.

Safeguarding Emergency Water Supplies

Equipment and materials for disinfection can be procured on short notice—Overdosing must be avoided to prevent serious consequences

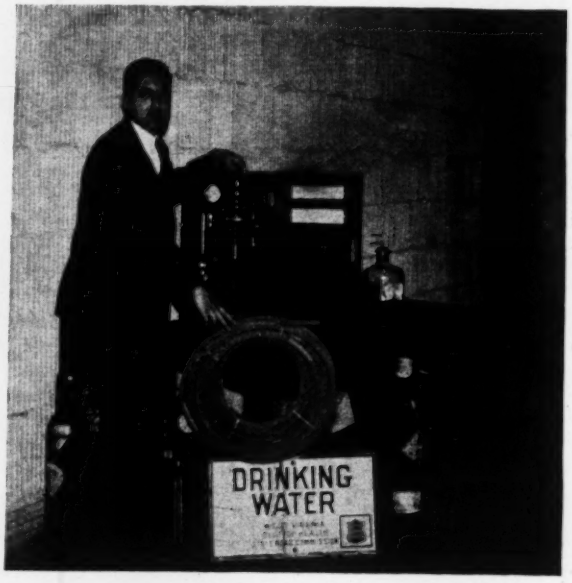
By LINN H. ENSLOW
Sanitary Engineer, The Chlorine Institute, New York City

THE HARD SCHOOL of experience has recently shown water-works officials in drought regions the necessity of preparedness in providing adequate treatment for inferior supplies when their use becomes unavoidable. Such occasions cannot be foreseen, but measures to meet them can be prepared long in advance. It is for the benefit of those water-works operators who did not suffer severely last year that Mr. Enslow has assembled the following material. Adequate preparation for periods of emergency forestalls criticism, lowers expense and discourages amateur efforts by well-meaning but inexperienced organizations or individuals. —EDITOR.

ASSURANCE that in an emergency an auxiliary water supply can be used with complete safety depends on the promptness with which water-works officials can put disinfection apparatus into service. In most cases the equipment and chemical manufacturers are prepared to make the necessary deliveries on short notice. Overdosing of chlorine, however, should be carefully avoided, as disagreeable tastes are likely to encourage the use of grossly polluted but tasteless waters. Unaccustomed concentrations of dissolved substances in raw water caused considerable difficulty during the 1930 drought, and the treatment necessary to produce a satisfactory industrial and domestic supply presented many unusual problems.

Availability of Emergency Equipment

In order to perfect a definite plan of action to be used in an emergency, the responsible personnel must know the type of treatment that can be most readily and promptly effected and the nearest location of necessary equipment and chemicals. The engineering division of nearly every state department of health has on hand portable chlorinating equipment that is loaned by the manufacturers for emergency use. Some state departments also carry on hand essential spare parts of chlorinating equipment. Most of the liquid chlorine manufacturers maintain stocks in the larger cities, and these locations are usually known to the state department of health. Delivery by truck or express is often a matter of but a few hours. In the meanwhile the water-works official can borrow a temporary supply of liquid chlorine, bleaching powder or sodium hypochlorite from some available bleachery, flour mill, laundry, laundry supply house, paper mill, sewage plant or swimming pool. It is the policy of some of the chlorine-equipment manufacturers to have a well-trained field representative report with emergency equipment and supplies to the chief engineer of the state health department. In several instances this service has proved of considerable value.



Emergency chlorinator used by the West Virginia health department

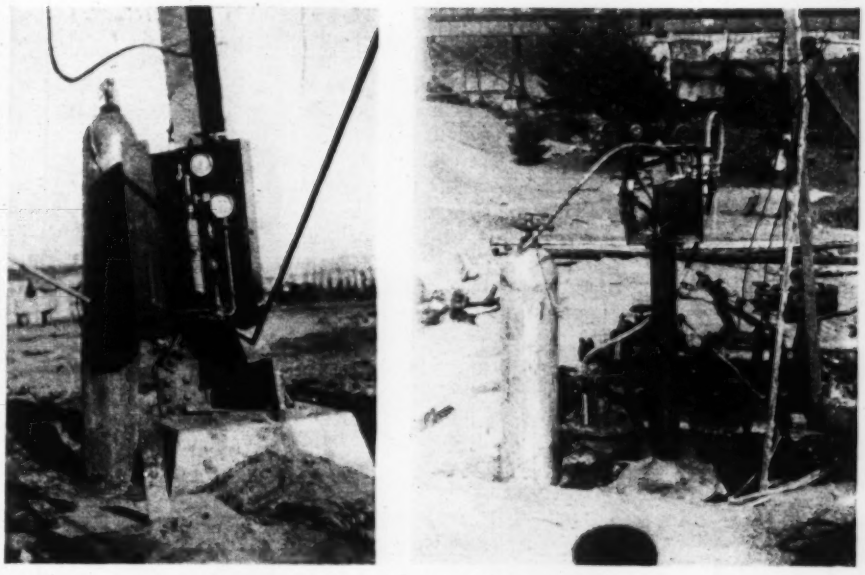
The most effective first step for a water-works official to take in a case of emergency is to communicate with his state department of health. This is adequately demonstrated by a recent experience of the West Virginia department, when a member of its engineering staff traveled all night with emergency purification equipment for Moundsville, W. Va., which he delivered ten hours after receiving a telephone call for assistance.

Danger of Overdosing

Careless overdosing of chlorine in emergency operations can be harmful. Indeed, with some waters nauseating byproduct tastes may be produced by ordinary chlorination. Adequate control—that is, frequent application of ortho-tolidin tests—is the practicable solution to the

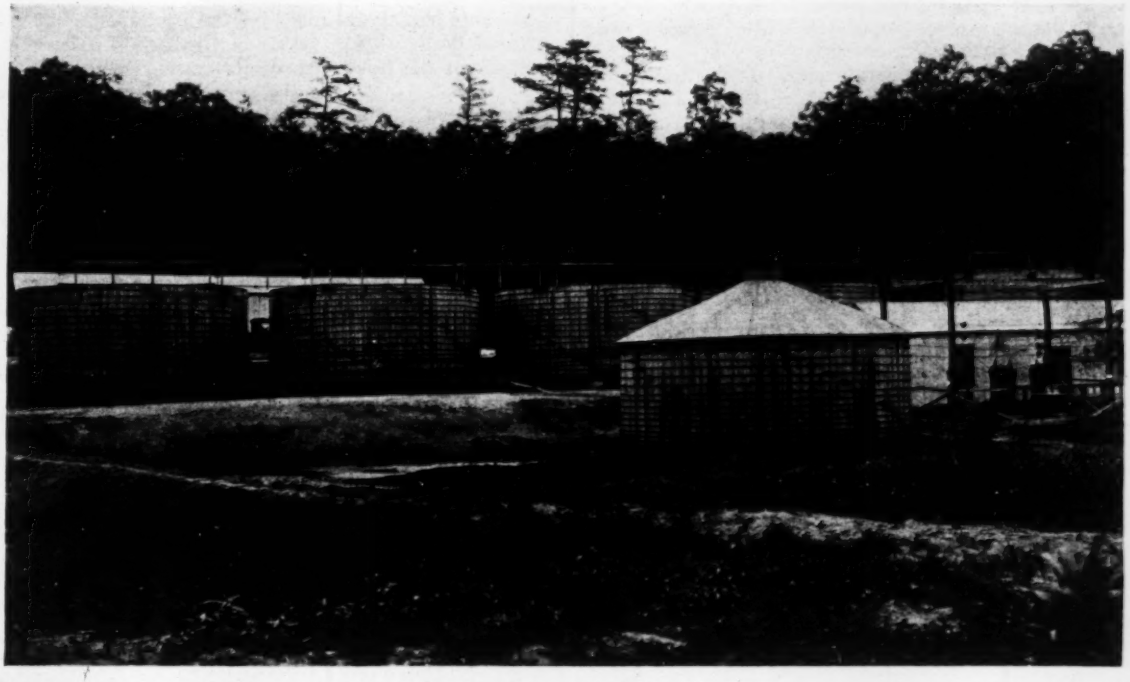
problem. If care is not exercised, the consumer may seek a more palatable unchlorinated drinking water and one that is more than likely to be grossly polluted. This can have more unfortunate consequences than the use of the emergency supply delivered into the mains in a less chlorinated state. Waterborne diseases were radically reduced in the early days of chlorination when excessive dosing was carefully avoided.

Chloro-byproduct tastes may in most instances be prevented by application of ammonia, efficiently distributed ahead of the chlorine. Ammoniation will also eliminate the tastes accompanying excessive chlorination. Ammoniation is a simple procedure, and ammonia can usually be obtained promptly from warehouse supplies, or an emergency supply may be borrowed from ice plants, meat-packing plants or hotels. When measuring devices are not available the gas may be run directly from the cylinder to the water in quantities that would be considered wasteful for ordinary practice but are justified until control equipment can be installed. It should be remembered, however, that the available chlorine acts less rapidly as a disinfectant when used with ammonia. To offset this effect the residual chlorine carried should be materially increased, to 0.5 p.p.m. or more. This can be done without creating chlorinous tastes.



Typical emergency installations of chlorine equipment

It may be desirable to provide aeration of emergency supplies, as was done at several filtration plants during the recent drought. At Charleston, W. Va., the Federal Water Service Corp. found the quickest means of securing aeration to be the use of compressed-air diffusion. An emergency order for a compressor was filled by the manufacturer on short notice, and within 72 hours the installation was completed and in operation. At this same plant, emergency chlorination equipment, chlorine for super-chlorination, and a supply of powdered activated carbon for dechlorination and taste removal were secured within 24 hours after telegraphing the orders. At Asheville, N. C., during the 1926 drought a complete filtration plant and pumping station of 2-m.g.d. capacity was approved by the state department of health, installed,



Emergency filter plant used at Asheville, N. C.

and in operation 52 days after the order was placed with the filter company. Chas. E. Waddell & Company, of Asheville, served as consulting and supervising engineers.

It happens too frequently that men in charge of waterworks operation have difficulty in securing, or fail to seek, advance authorization for emergency expenditures. Much valuable time can be lost in waiting for approval of requisitions for emergency equipment or materials, and this situation may be the one weak point in the relief program. It should be corrected in municipal operations, as it has been in water companies. In the recent drought the latter secured equipment and improvements promptly with no red tape and without abuse of authority. Municipalities can and should be equally efficient in operation of utilities. While most manufacturers of water-treatment equipment and materials will not delay deliveries during emergencies until authorized purchase orders are received, it is always safer to have authorization beforehand and thus avoid conflict with superior officers.

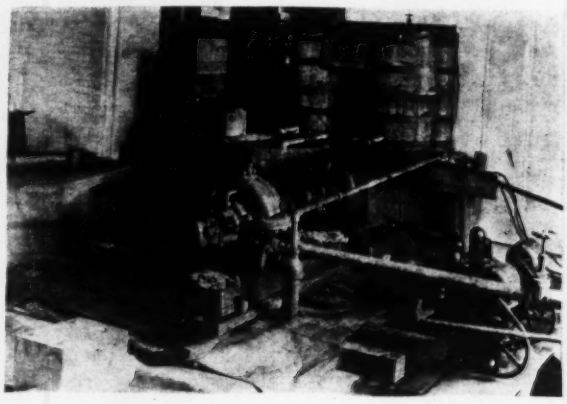
In treating small supplies during the 1930 drought, temporary devices were frequently used to feed solutions of chlorinated lime or hypochlorites. A recently developed high-test hypochlorite was extensively used. This chemical, calcium hypochlorite, contains 65 per cent available chlorine, holds its strength in storage or during use from the cans, and dissolves readily in cold water without lumping. Solutions can be prepared to contain 25 per cent of the powder, or approximately 15 per cent available chlorine.

In Pennsylvania the engineering division of the state department of health supervised a variety of treatment problems connected with the recent drought. The department's mobile laboratories were employed effectively in checking the quality and treatment of emergency supplies. H. E. Moses, of the division, reports that in one instance a Pennsylvania stream carrying acid mine drainage was treated with lime in the streambed that served as a coagulation basin. The partly clarified water was then filtered through a tub filter on the bank of the stream and pumped into the mains. In several instances where the regular water supply failed, fire-engines were used to pump an emergency supply into a fire hydrant on the distribution system. In each case chlorination was employed with frequent use of the ortho-tolidin test to control the dosage.

Manganese and Iron

Manganese and iron in depleted regular surface suppiles or emergency well supplies proved to be an extensive problem during the 1930 drought. At the filtration plant at Luke, Md., iron, manganese and alumina in the Potomac River water caused considerable difficulty in industrial and domestic uses. Aeration, prechlorination and application of caustic soda solution to raise the *pH* value to 10 or more was necessary to remove the manganese completely. Iron and alumina and half the manganese could be removed by prechlorinating and slightly increasing the alkalinity; but complete manganese removal was a difficult problem and an expensive one because of the additional alkali required. No coagulant was necessary because of the sulphates of iron and alumina present in the raw water.

Emergency wells put down by the Community Water Service Co. at Canonsburg, Pa., produced water so highly impregnated with iron and carbon dioxide that it was necessary to construct an aeration and iron-removal plant, including a sedimentation basin 300 ft. long. A roughing or contact filter of gravel was constructed across the 35-ft. width of the basin. The basin effluent was filtered through a tub filter. It was then found that the air-lift created sufficient aeration, and the supplementary aeration was discontinued. Later, water had to be used from a near-by creek to supplement the supply from the four emergency wells, and the large amount of mine drainage it contained necessitated the application of lime. The gravel-roughing contact filter proved sufficiently effective in removal of iron, and consequently the sand filter was discontinued. This filter was really the most essential part of the emergency scheme, according to Guy G. Morrow, district superintendent at Canonsburg.



Equipment for feeding chlorinated lime

Along the Atlantic seaboard a number of water supplies were seriously contaminated by seawater diffusing upstream as a result of low streamflows. At Elizabeth City, N. C., and at other places considerable difficulty was experienced with coagulation and color removal because of the increased salinity, low oxygen content and the occasional presence of hydrogen sulphide. Aeration and superchlorination of the raw water improved conditions materially. Chlorinated copperas and sodium aluminate were continued as the coagulants but at increased dosage. At Havre de Grace, Md., the chloride content of the Susquehanna River rose from the normal of 8 to 885 p.p.m., and the supply had to be abandoned.

Increased hardness of surface supplies was noted at many places. Removal of the excessive hardness was a problem only in that it required additional equipment for applying increased quantities of chemicals and because of the extra cost involved. At Cincinnati the hardness increased from a normal of 100 p.p.m. to 232 p.p.m., and at Columbus, Ohio, the hardness increased to 375 p.p.m. Taste troubles at Cincinnati were pronounced, but Columbus escaped this difficulty.

Combating Taste Troubles

About every known means of taste elimination was employed at one point or another during the 1930 drought. These included the liberal use of ammoniation, pulverized activated carbon applied prior to filtration with or without superchlorination, excess lime treatment, permanganate application, activated carbon filters and other schemes of superchlorination and dechlorination. What proved effective at some points proved ineffective or impracticable at others. Excess lime treatment for sterilization was employed at several points to combat tastes created by simple chlorination. Ironton and Bellaire, Ohio, used this scheme on the Ohio River water.

At the Delaware, Ohio, filtration plant, application of potassium permanganate to the raw water (3 lb. per

million gallons), followed by lime application to precipitate the manganese, proved satisfactory. Permanganate application frequently proves superior to other chemical applications for odor elimination, and this is particularly true when decaying diatoms are responsible for the odor.

At Moundsville, W. Va., wells in the Ohio River became infected by infiltration of the river water, and chloro-phenol tastes developed for the first time in the history of the supply. An emergency ammoniator was rushed to Moundsville by the state department of health engineering division, and ammonia applied ahead of the chlorine in a ratio of 1 part ammonia to 2 parts chlorine effectively cleared up the taste troubles, according to Martin E. Flentje, of the Community Water Service Co. Ammonia was effectively used at other points but did not always prove sufficient in itself. At Beaver Falls, Pa., and Gassaway, W. Va., the phenol content of the river water was often too great to be counteracted by ammonia.

Activated carbon proved a boon at a number of plants where the regular supply became so highly contaminated as to cause serious taste troubles. In some instances the powdered carbon was applied to the raw water, and in others its application to the coagulated water just ahead of the filters proved the most practicable method. In the more severe conditions the quantity required was relatively large, 1 grain per gallon or more, but its effectiveness justified the increased operating costs during emergency periods. The larger plants at which powdered activated carbon was used were those at South Pittsburgh and New Castle, Pa., Huntington and Charleston, W. Va., East St. Louis, Ill., Louisville, Ky., and Saginaw, Mich., this last place handling a raw water notoriously difficult even under normal conditions. Of the more recently developed measures for securing an absolutely dependable destruction of bacteria and taste elimination, superchlorination followed by dechlorination with activated carbon, where practicable, remains the most certain. For emergency use this requires filtration or sedimentation equipment, which is not always available.

Acknowledgment—The author is grateful to the following persons for much of the data in the foregoing article: E. S. Tisdale, H. E. Moses, Richard Messer, H. E. Warring, Martin E. Flentje, Geo. D. Norcom, E. L. Filby, A. R. Murphy, A. S. Behrmann, Charles F. Thomas, Charles Eastwood, H. F. Wiedeman and E. M. Jones.

Managua Water-Works Restored by Army Engineers

THE WATER-WORKS of the city of Managua, Nicaragua, destroyed by the earthquake of March 31, has been restored to a condition where it is able to supply the present needs of the city, according to a report to the Chief of Engineers from Lieut-Col. Dan. I. Sultan. The character and the incomplete condition of Managua's new water-supply system was described in our issue of April 23, p. 696. A report from Colonel Sultan published in the same issue described the effect of the earthquake upon the water-supply system. Landslides had partly buried the pumping plant on the shore of Lake Asososca, and there were indications that the supply and discharge line to the storage reservoir had been disrupted by earth movement. The reservoir, a reinforced-concrete structure, was undamaged.

In order to provide for an immediate supply, engineers under the command of Colonel Sultan set up a temporary pumping plant on the shore of Lake Managua, close to the city, and pumped into the old supply main of the city. This water was chlorinated on account of the polluted condition of the lake. The temporary system was put into operation on April 6 and by April 10 was pumping at the rate of 50,000 gal. per hour. By that date enough of the mains had been repaired to permit water to reach all the main parts of the city. There was, however, an enormous amount of leakage, as almost all house connections were broken and cutoff boxes covered by debris.

While work on the temporary supply was in progress, other gangs were working to dig out and repair the new plant on Lake Asososca. The native workmen had to be kept under guard to prevent their escape because of the disconcerting place in which they had to work in digging out the pumping plant. Material dislodged from the steep bank above the pumping plant was loose, and frequent tremors kept the laborers in fear of another major slide. In five days the pumping plant had been dug out and a 30-ft. wall of heavy timber erected to prevent further slides from damaging it.

One break was found in the spiral riveted steel discharge line from the pumping plant to the reservoir. It could not be repaired with the one spare length of pipe on hand because the earth movement had telescoped the ruptured pipe by a forward movement of about 4 in. A length of cast-iron pipe was cut and substituted for the steel pipe. The cast-iron supply line from the reservoir to the city was pulled apart about 3 in. at one joint. New mains in the city were not badly damaged.

The pumping plant consisted of two 120-hp. diesel engines, direct-connected through speed transformers to 6-in. pumps with capacities of 50,000 gal per hour. No spare parts were available. By April 9 one pump had been put into serviceable condition by dismantling the second pump for spare parts, and pumping service was restored on that day. On the following day the temporary plant on Lake Managua was taken out of service. The electric pump from that plant subsequently was taken to the plant on Lake Asososca for use there.

In addition to the water-supply work, the engineers under Colonel Sultan directed the work of checking the conflagration that followed the earthquake and of throwing down dangerous walls and opening streets to traffic. The fire-fighting work was severely handicapped by the lack of water other than what could be brought in tanks from the lake. Further, without an adequate supply of water, attempts to check the fire by the use of dynamite were not as successful as had been anticipated because, except where buildings were badly damaged by the earthquake, they offered greater resistance to the spread of fire when left standing with their heavily plastered walls and tile roofs. When thrown down either by dynamite or by the earthquake the highly inflammable mass of cane upon which the tile is laid and the inflammable backing of the plastered walls were exposed to falling sparks. Some idea of the dryness of this material can be obtained when it is realized that no rain had occurred in Managua since early September. By checking the lateral spread of the fire, taking advantage of the prevailing wind and removing inflammable material from its path, the army engineers were able by April 2 to confine it to an area of 31 blocks, where it smoldered for more than a week.

A New Water Supply in Ten Months

New well field developed, 26 miles of supply main laid, pumping stations and storage tanks constructed at high speed

By MALCOLM PIRNIE and CHARLES F. RUFF
Consulting Engineers, New York City

CONSTRUCTION of an entire new water supply in less than a year was the remarkable record of the Pinellas Water Co. in carrying out its contract to supply water to the city of St. Petersburg, Fla. From a newly developed well field 26 miles away a 36-in. line of precast concrete pipe was laid along private right-of-way, through cypress swamps and across shallow streams, to connect with the existing city distribution system. Danger from collapse of the loose trench material encountered was avoided by the rapid prosecution of the work. A rate of progress of 1 mile per week was attained during most of the pipe-line construction. The line discharges into an equalizing reservoir just outside the city, from which the water is pumped into the distribution mains.

For many years the water supply for St. Petersburg was taken from wells in the city. Increasing demands on these wells gradually increased their hardness and salinity until, in 1929, the salt content varied from 1,000 to 2,700 p.p.m. (sea water contains about 20,000 p.p.m.) and the hardness from 759 to 1,624 p.p.m.

In September of that year the city entered into a contract with the Pinellas Water Co., giving them exclusive right for 30 years to supply all water wholesale to the city for distribution through the city's existing mains. The contract specified a water of less than 160 p.p.m. hardness and 25 p.p.m. salt content. It called for an immediate capacity of 10 m.g.d. and an ultimate capacity of 20 m.g.d. The first water was to be delivered one year after the contract became effective.

The project consisted of drilling twelve wells across Old Tampa Bay from the city (*ENR*, Sept. 11, 1930, p. 402), installation of well pumps and aerator, construction of a 26-mile 36-in. pipe line to the city and of a storage reservoir and pumping station near the city to raise the water to city distribution pressure.

In October the general contract for the work was awarded to the J. B. McCrary Co., of Atlanta, and the construction of the pipe line to the Lock Joint Pipe Co. The general contract was on a cost-plus-fee basis, since the plans were not sufficiently complete to permit of any other arrangement. The pipe contract was made on a price-per-foot basis. Surveys for the location of the pipe line and purchase of right-of-way were commenced at the same time. An existing air map of most of the route was used for the preliminary location and saved a great deal of field work, especially useful here because Geological Survey maps were lacking.

Most of the line was built on private right-of-way, as the saving in length more than offset the land cost. Also, construction along the roads proved relatively slow and difficult, due to the necessity of protecting the road surface and keeping it open to traffic. Securing the right-of-way was accomplished in about six months, in some cases barely ahead of construction. The problem was complicated by the many subdivisions encountered, relics of the land boom. It was necessary at times to deal with a new owner every 50 ft. Approximately 200 miles of survey line was run to determine all the section corners and boundaries of the various parcels. During the early stages of the work location of the line, surveys of the right-of-way, negotiations to purchase it, final design and construction of the pipe line all being done simultaneously.

Fig. 1—Where fast work avoided trouble
Trench was dry when first excavated but filled with water in less than 20 min.

Well Field

The water-bearing stratum at the well field near Cosme is the Tampa limestone. Descriptions of the field and its geology and well supplies for this section of Florida were published in *Engineering News-Record* Sept. 11, 1930. The twelve wells were spaced about 1,000 ft. apart. They have an average depth of 300 ft. and yield from ¾ to 2 m.g.d. each. The total peak capacity of the installation is 16 m.g.d. Each well is equipped with a deep-well pump placed 40 to 50 ft. below the ground surface. Drawdowns vary from 6 to 25 ft. The wells and starting switches are housed in steel shelters just large enough to cover them. Doors on each side of the house provide access to all parts of the machinery, and the whole house can be easily lifted off when it is necessary to bring the pump up out of the well. Steel houses were used to prevent damage by hunters, who delight in shooting at any little isolated structure in the woods.

The well pumps deliver the water to an aerator located on the roof of a 300,000-gal. steel tank. With this tank full there is sufficient head to deliver 10 m.g.d. by gravity to the low-level reservoir near the city. Near the aerator tank is a booster station containing one pump, which delivers water into the main pipe line at the rate of 15 to 17 m.g.d., depending on the water level in the

lower reservoir. The twelve wells are controlled from this point by a push-button system equipped with indicating lights. Four float switches set for different levels in the aerator tank can be plugged into the control system to connect with any well. This device automatically maintains the level in the tank and permits the operator to visit various wells for oiling and inspection. A high- and low-level alarm in the tank is also provided. Chlorine is applied to the water as it enters the pipe line.

Pipe Line

The pipe line consists of 26 miles of 36-in. precast concrete pressure pipe, with 1 mile of cast-iron pipe at the well field end (running to the last four wells) and 3½ miles at the city end (connecting to various points in the city's distribution system).

The concrete pipe was manufactured at Dellwood, a village near the middle of the line. Here the pipe company erected a plant having a capacity of 80 12-ft. lengths per day. The pipe was made up of 1½-in. concrete lining, a cylinder of 14-gage steel that had been welded and air-tested for leaks, and a 2½-in. concrete covering. In this covering was placed the reinforcing of 1x¼-in. steel bands, spaced according to head specified for different parts of the line. Allowable steel stress was 12,000 lb. per sq.in. A rich concrete was used, 2.4 to 2.6 bbl. of cement per yard. Clean silica sand and gravel from the Lake Wales section was used as aggregate, proportions about 1 : 1½ : 1½. The pipes were poured in vertical steel forms and steam-cured for eighteen hours. They were stored in the yard for six days more, where they were kept moist with sprinklers and then hauled to the job. Cylinder compression tests were made daily to insure the specified seven-day strength of 3,000 lb. per sq.in.

Most of the pipe was laid with pull shovels having 1- or 1½-yd. buckets. A number of draglines were rented locally and used. The first pipe was laid January 24, the last on Aug. 23, 1930. The average progress was 1 mile per week after the work got under way. Seven laying crews were used at the maximum.

Difficulty was encountered with wet excavation in sand in a number of swamps and at two water crossings. The joint caulked from the inside was a great advantage in the loose wet material. It was only necessary to keep the trench open long enough to place the pipe and bell it up. To dig 12 ft. of trench and place the pipe required about 10 min. A good part of the material encountered would stand that long without sheeting, so that the pipe could be laid very rapidly. With the smaller draglines, which could not dig so rapidly, it was necessary to make a trench three or four times as wide or to use sheeting to get the pipe down to grade.

At the two water crossings the bottoms of the pipe were 7 and 11 ft., respectively, below sea level. The depth of water was from 2 to 5 ft. Two dikes, 100 ft. apart, were thrown up with material from the bottom for half the length of the crossing. The water between the dikes was pumped out and the pipe laid the same as on the shore. In crossing some of the cypress swamps the bottom was so soft that pile bents were placed under the pipe to hold it to grade. At one point 40-ft. piles were needed to reach firm material, but usually 5 or 10 ft. sufficed.

TABLE I—LEAKAGE TESTS, 36-IN. CONCRETE PIPE LINE

Length of Line Tested, Ft.	Pressure of Water, Ft.	Duration of Test, Hours	Leakage in 24 Hours, Gal.	Leakage per Day per Mile, In. Gal.
12,237	165 to 230	24	1,349	16.1
53,064	96 to 140	12	3,220	8.9
57,503	136 to 186	24	3,423	8.7

TABLE II—FRICTION COEFFICIENT TEST, 36-IN. CONCRETE PIPE LINE

Rate of Flow, M.G.D.	Total Head	Slope, Ft. per 1,000	In Williams-Hazen-Formula
9.5	36.9	.319	146
9.6	35.7	.309	150
10.0	37.5	.324	153
17.2	105.5	.913	150
16.8	102.5	.885	149
16.6	100.6	.870	149
8.7	28.6	.247	154
8.9	30.7	.265	151
9.2	32.1	.278	152
Average C			150.4

Most of the pipe was hauled to the job in trucks, one 3-ton length making a load. On some portions, however, it was necessary to transfer the pipe to wagons and sledges drawn by crawler tractors. The sledges were made of sheets of 14-gage steel, bent up at the ends.

The completed line was tested for leakage under operating pressure, with the results shown in Table I. The total leakage for the line was 8,000 gal. per day, or an average of 10 gal. per inch of diameter per mile of pipe.

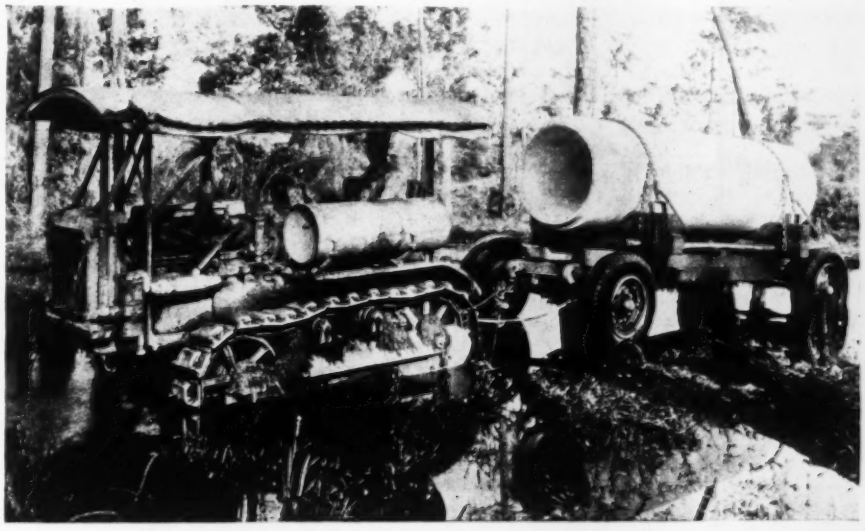


Fig. 2—Transporting pipe over wet ground with tractor and trailer

A test of the friction coefficient was made over a 22-mile section of the line. This section contained fifteen 24-in. valves with reducers on each side. The loss through one of these valves was measured with a water manometer and varied from 1 to 4 in. for the rates used in the test, including the loss through 157 ft. of pipe. The valve friction has been eliminated from the coefficients given in Table II. Flow was measured by a venturi meter, previously tested. The head was measured at the upper end with a tested pressure gage, at the lower end

by measuring the tank level with a tape. Levels of the benchmarks used checked to within 0.3 ft.

The heavy concrete pipe was considered advantageous for this work for several reasons. In the soft saturated sand and muck encountered a lighter pipe would float when empty. The time necessary to make an ordinary joint would have required sheeting, or much wider trenches, over fully half the job and continuous pumping to keep the trench unwatered. Finally, the concrete pipe was considered to be more resistant to corrosion from the saturated soil and from the salt water at the two water crossings. An extra inch of outside wall thickness was added to all pipe used at salt-water crossings.

Fig. 3—Pipe-laying follows close behind excavation in building line through cypress swamp

Pumping Station and Reservoir

The main pumping station and reservoir are located immediately north of the city limits. The reservoir is a steel tank 117 ft. in diameter and 42 ft. high and has a capacity of 3½ million gallons. A riser pipe placed in the center of this tank rises to a height of 52 ft. above the bottom. This pipe is connected directly to the pipe line, is without valves and serves as a relief pipe when the tank valve is closed, which eliminates the possibility of serious water hammer on the line. It also supports the roof girders.

The function of this large reservoir is to permit operation of the well field and pipe line at a uniform daily rate. It was estimated that the city's demand with pumps at the well field would increase the pumping charges about 8 per cent. This is because the increased friction at high rates of flow would not be entirely offset by the decreased friction at low rates. The height of the tank is such that all the head remaining from the aerator tank after friction losses becomes available at the suctions of the pumps. The tank holds sufficient reserve to permit inspection and repairs when they are needed.

The station contains three motor-driven centrifugal pumps of 3-, 6- and 13-m.g.d. capacity each. Water can be drawn from either the tank or the line or from both togther through the suction line located in a pit running the entire length of the pump room. Starting compensators replace a switchboard. Each pump is equipped with an automatic check valve bolted to the discharge flange. Tests of the units showed the following overall efficiencies: 3-m.g.d. unit, 77 per cent; 6-m.g.d. unit, 76.2 per cent; 13-m.g.d. unit, 83.5 per cent.

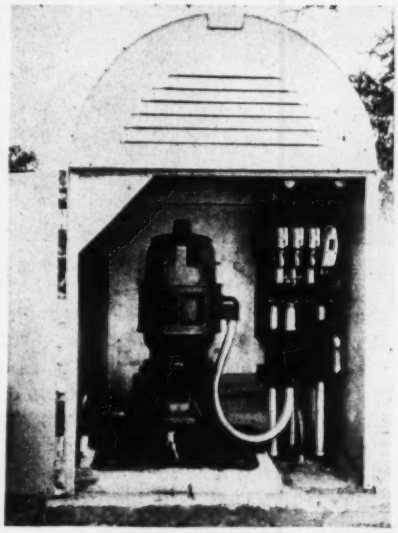


Fig. 4—Steel shelter for each well pump can be lifted off when necessary to remove pump from well

An important part of the station equipment is the venturi meter apparatus that measures the amount of water sold to the city. Two meters are used, one for the smaller pumps, the other for the large pump.

A long-distance gage in the station shows the water level in one of the city's ½-m.g. elevated tanks. It enables the operator to adjust pumping rates so as to keep these tanks nearly full and avoid overflowing. The gage on a 5-mile circuit is leased from the telephone company.

The building is of Spanish architecture to harmonize with the local style. The entrance leads into a lobby with a drinking fountain. Offices for the superintendent are on the right, a store-room and laboratory on the left. The pump room, 16 by 60 ft., houses an 8-ton traveling crane. The station roof consists of three concrete slabs spanning the whole width and connected with copper expansion joints. Provision is made for the roof to slide on a tar joint on top of the tile walls.

The concrete supply main carries the water from the pumping station 2 miles farther into the city, where it is connected to the distribution system at several points through lines of 16-, 20- and 24-in. cast-iron pipe.

Before starting the supply the tank and the pipe line were flushed out with water containing a high chlorine dose. This was afterward cut down to give a residual of 0.02 p.p.m. At the summer rate of 3 m.g.d. the water is in the pipe line two days on its way to the city. A rise in temperature of 2 deg. F. and no change in hardness have been recorded.

Water was supplied the city on Sept. 14, eleven days ahead of the contract date, and the city's old wells were shut down. They will be maintained as an emergency supply. Several days were spent flushing the old water from the city mains; and by Sept. 18, the official opening date, the new water had reached all parts of town.

Personnel

The works were designed and the supervision of construction carried on by the authors. R. V. Giles and C. A. Barnett were resident engineers on the job. The Lock Joint Pipe Co. was represented by W. R. Brend, construction superintendent. The McCrary Co. was represented by A. P. McCrary.

Long-Range Planning Essential in Developing Municipal Utilities

By JOHN H. GREGORY
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A TIMELY editorial entitled "Need for Water Planning" appeared in *Engineering News-Record*, Feb. 19, 1931, the last sentence of which was: "The still continuing drought emphasizes the importance of supply reinforcement, larger factors of safety, and restudy of plans; and though pipelines, pumps and storage may get along on ten-year planning, supply sources are more safely based on a foresight of 30 to 50 years." The writer is in accord with these views. In speaking of pipelines, pumps and storage the word "may" is used; in the light of some of the facts hereinafter presented it would appear that, for large projects, the ten-year period might well be changed to a ten- to fifteen-year period.

It is the purpose of this article to set forth some of the results of the writer's investigation as consulting engineer on water-supply matters to the Public Improvement Commission of Baltimore, inasmuch as engineers are apt to forget that many years are often required to carry through to completion major water-supply and sewage-disposal projects. Small cities can carry through such projects in a few years, but the experience of large cities has been that from ten to fifteen years or longer is often required to bring them to completion.

Prior to the appearance of this editorial the Public Improvement Commission of the city of Baltimore took the preliminary steps necessary to submit to the Maryland legislature two enabling acts, one for $7,500,000 for water main extensions and distribution system requirements, and the other, for $27,500,000, for additional water supply, the latter to be spread over the next ten to fifteen years. As consulting engineer to the commission on water-supply matters, the writer had occasion to prepare a memorandum for the commission giving the time required to carry through to completion certain major water-supply projects in this country, and at the same time he extended his investigation to cover certain major sewage-disposal projects. Some of the results are related here.

Water-Supply Projects

Baltimore—In 1918 it became evident that more storage was needed either at or above the Loch Raven dam on the Gunpowder River, and James W. Armstrong, filtration engineer, in charge also of the source of water supply, then began an investigation for the department of water supply. This led to the employment of Nicholas S. Hill, Jr., and James H. Fuertes, who made a very extensive investigation on water-supply needs and other matters and submitted their report, with recommendations, on June 23, 1920. Subsequently the Loch Raven dam was raised, bids having been received on March 20, 1921, and on May 20, 1923, water first flowed over the crest of the dam. Following this, steps were taken to carry through the second and final development of the Gunpowder watershed above the Loch Raven dam—namely, the construction of the Prettyboy dam and reservoir. Bids for the Prettyboy dam were received on Sept. 24, 1930, and the contract calls for the completion of the dam on Oct. 31, 1932.

The elapsed time from the 1918 preliminary investigation of the filtration engineer to the scheduled date of completion of the Prettyboy dam in 1932 will be fourteen years.

Boston—By legislative act passed on June 9, 1893, the Massachusetts state board of health was authorized to investigate, consider and report on the water-supply needs of Boston and vicinity. The investigation was carried out under the immediate direction of Frederic P. Stearns, chief engineer of the board. The report of the board, known as the 1895 report on metropolitan water supply, was submitted to the legislature in 1895, and recommended taking water from the South Branch of the Nashua River, the watershed to the west of the Sudbury River from which Boston then was, and still is, getting water. Next, the Metropolitan Water Board was created, by legislative act passed on June 5, 1895, and was authorized to construct the works recommended in the report. These works were built and are now known as the Wachusett system.

On March 7, 1898, water was first admitted from the Nashua River to the Wachusett aqueduct, by which it was conveyed into one of the storage reservoirs on the Sudbury watershed and thence to Boston. This permitted the diversion of water from the Nashua River, the amount depending on the flow of the river. The Wachusett dam had not yet been designed. The contract for the dam was awarded on Oct. 1, 1900, and by the end of 1905 the Wachusett dam and reservoir were substantially completed.

The elapsed time from the 1893 authorization of the legislature to investigate and report on water-supply needs of Boston and vicinity to the substantial completion in 1905 of the works built was twelve years.

The more recent experience of Boston may also be cited. By legislative act passed on June 24, 1919, the Massachusetts state department of health and the Metropolitan Water and Sewerage Board were authorized to investigate and report jointly on additional water-supply needs of Boston and the metropolitan district, and by legislative act passed on May 9, 1921, the time in which

to report was extended. The report, known as the 1922 report of the joint board, was submitted in 1922 and recommended taking water from the Ware and Swift rivers, these two rivers lying west of the Wachusett reservoir on the Nashua River.

Opposition to the 1922 report led the legislature to authorize, by legislative act passed on June 3, 1924, a board, known as the Metropolitan Water Supply Investigating Commission, to investigate further and report. This commission reported in 1925, but authority to proceed with the construction of additional water-supply works was not obtained until the following year, when, by legislative act passed on May 28, 1926, the Metropolitan District Water Supply Commission was created. The work has been under way ever since, and on March 1, 1931, the Wachusett-Coldbrook tunnel was sufficiently completed to allow water to be diverted from the Ware River through the tunnel into the Wachusett reservoir and thence through existing works to Boston and the metropolitan district.

The elapsed time from the 1919 authorization of the legislature to investigate and report on additional water-supply needs of Boston and the metropolitan district to the completion in 1931 of the Wachusett-Coldbrook tunnel, the first installment of the Ware and Swift rivers project, was twelve years.

No storage dam and reservoir is to be built on the Ware River—flood-flows only are to be taken from the Ware, at certain times of the year. The tunnel is to be extended farther west to the Swift River, where two dams and a reservoir are to be built. Considerable land has been acquired for this part of the project and contract for the construction of the 10.4-mile Coldbrook-Swift tunnel to the Swift River was let in early April, 1931. The two dams forming the Swift River reservoir will not be built at present. As bearing on the situation in Boston and the metropolitan district, in 1926 a possible shortage of water became apparent to the legislature. By legislative act passed on March 15, 1927, an emergency supply of inferior waters was authorized, to tide over a possible shortage until the Wachusett-Coldbrook tunnel would be ready for use. And in 1927 and 1928 emergency pipe lines were built to make these inferior waters available for emergency use.

Detroit—On Dec. 2, 1919, the board of water commissioners authorized William C. Hoad to report on an additional water supply from Lake St. Clair, and on Sept. 27, 1920, Gardner S. Williams was authorized to report on an additional water supply from Lake Huron. Williams reported on Lake Huron on Sept. 10, 1921, and Hoad on Lake St. Clair on Feb. 17, 1922. Later, on Sept. 6, 1922, T. A. Leisen, civil engineer of the board of water commissioners, also submitted a report on an additional water supply from Lake St. Clair. Still later, on Oct. 2, 1923, George H. Fenkell, general manager, board of water commissioners, submitted a report on an additional water supply for Detroit and vicinity.

On Dec. 11, 1923, a board of consulting engineers, consisting of Fenkell, Hoad, Hubbell, Leisen and Williams, was authorized to report on all the projects for an additional water supply. They did so, on Jan. 8, 1924, and recommended continuing the Detroit River as a source of water supply. The plan was adopted, and in March, 1924, the first steps were taken to acquire property for the additional water supply. Construction work has since been proceeding and it is expected that the additional water-supply works will be completed in the fall of 1932.

The elapsed time from the authorization of the first investigation in 1919 for an additional water supply to the expected date of completion in 1932 of the new works now under construction will be thirteen years.

New York City—The final campaign for an increase in the city's water supply, which led finally to the building of the Catskill works, began with a report presented by a special committee on March 15, 1897, to the Manufacturers' Association of Brooklyn. On Mach 23, 1900, John R. Freeman submitted to Bird S. Coler, Comptroller, a report on the New York water supply, and in August, 1900, a report was made by the Merchants' Association of New York on the water supply of the city of New York. In 1901, 1902 and 1903 bills to add to the water supply of New York City failed to pass the legislature. On Nov. 30, 1903, came the report of the commission on additional water supply, known as the Burr-Hering-Freeman report, and as the result of this report the Catskill water-supply works were built. Again, in 1904, a bill to add to the water supply of New York City failed to pass.

Finally, by legislative act of June 3,1905, the board of water supply was created for "providing for an additional supply of pure and wholesome water for the city of New York." The Catskill works were built by this board. The first stage, comprising the development of the Esopus watershed, was substantially completed in 1917, at which time a partial supply of water from the Catskills was made available for New York City.

Lengths of time between inception and completion of water-supply and sewage-disposal work:

WATER SUPPLY

BALTIMORE
Additional water supply at and above the Loch Raven dam, 14 years.

BOSTON
Metropolitan water-supply works (Wachusett works), 12 years.
Additional water-supply works (Ware and Swift river works):
(First installment—from the Ware), 12 years.

DETROIT
Additional water-supply works, 13 years.

NEW YORK CITY
Catskill water-supply works:
First installment, from the Esopus, 20 years.
Second installment, from the Schoharie (including the Esopus), 29 years.

SAN FRANCISCO
Hetch Hetchy additional water-supply works, 21 years.

SEWERAGE AND SEWAGE DISPOSAL

BALTIMORE
Sewerage and sewage disposal, 21 years.

DETROIT
Sewage disposal (some intercepting sewers built; sewage-disposal works not yet built), 19 years.

NEW YORK CITY
Sewage disposal (bids for first units of first large sewage-disposal works), 25 years.

The elapsed time from the 1897 report to the Manufacturers' Association of Brooklyn to the completion in 1917 of the Esopus development, the first installment of the Catskill works, was twenty years.

The second and final stage involved the construction of the Schoharie reservoir and the diversion of water from this reservoir into the Esopus watershed. A partial supply of water from the second installment of the new works was made available in February, 1924. The Schoharie development as a whole was substantially completed by the end of 1926.

The total elapsed time from the 1897 report to the Manufacturers' Association of Brooklyn to the substantial completion in 1926 of the Schoharie development, the second and final installment of the Catskill works, was 29 years.

In passing, a few notes bearing on water shortages in New York City may be of interest. In 1869 the rainfall was very small and the city had to take drastic measures to provide water. Again, in 1876-77, the city suffered from drought and was confronted with a water shortage. To meet this situation special legislative enactment was needed, whereby additional water was secured by condemnation.

In 1880-81, two of the driest years on record in the history of New York water supply, all the reservoirs were emptied and it was necessary to throttle the supply. Great hardship was the result. Again new ponds were tapped to meet the emergency. As of 1904 and prior thereto, the increasing demand for water exceeded the safe yields of the supplies available and severe shortage had been escaped on more than one occasion.

As to the present situation, it was stated in February in the New York papers and elsewhere, that unless there was substantial rain and snow in the following few months on the watersheds supplying New York City with water, rationing of water and a drastic reduction in the supply for personal and industrial use would be inevitable this coming summer. Fortunately, recent rains have alleviated the present situation, and a decision of the U. S. Supreme Court has made it possible for the city to start development of an additional supply from the Delaware River watershed.

San Francisco—The city of San Francisco is building what is known as the Hetch Hetchy water-supply works. The report which definitely started this project was that of John R. Freeman, dated July 15, 1912, in which he recommended the Hetch Hetchy development on the Tuolumne River as a source of water supply. On Oct. 31, 1912, the Spring Valley Water Co., which was supplying San Francisco with water, submitted a report to the secretary of the interior and the advisory board of engineers of the U. S. Army on the future water supply of San Francisco.

To develop the Hetch Hetchy project action of Congress was needed. On Dec. 19, 1913, President Wilson signed the Raker bill, known as the Hetch Hetchy grant. The contract for the Hetch Hetchy dam was awarded on Aug. 1, 1919, and the first contract for the aqueduct tunnel on May 3, 1920. Work has since been proceeding, and the Hetch Hetchy project is programmed for completion in 1933.

The elapsed time from the 1912 Freeman report to the expected completion of the Hetch Hetchy project in 1913 will be 21 years.

On May 1, 1928, the purchase of the Spring Valley Water Co. was authorized by vote of the people; the bonds were sold in the fall of 1929 and in March, 1930, the property of the company was taken over by the city, which is now being supplied from the near-by sources formerly owned by the water company.

In the fall of 1929 San Francisco experienced a severe drought, which extended into 1930. In the latter year the city signed a contract with the East Bay Municipal Utilities District, comprising the cities lying to the east of San Francisco Bay, to supply San Francisco with water in case of emergency, not to exceed 20,000,000 gal. daily, and in the same year, 1930, the city built a 14-mile emergency pipe line to permit securing an emergency water supply until the Hetch Hetchy supply becomes available two years hence, in 1933.

Sewage-Disposal Projects

Baltimore—By resolution approved May 25, 1893, a sewerage commission was authorized to examine into a more perfect system of sewerage for the city of Baltimore. This commission, for which Rudolph Hering and Samuel M. Gray were consulting engineers and Kenneth Allen principal assistant engineer, reported on Sept. 20, 1897. By resolution approved March 18, 1898, the commission was continued and authorized to make further investigations. Its second report was submitted on May 22, 1899, but it was not until five years later, by the enabling act of the legislature passed April 7, 1904, that a special commission to be known as the sewerage commission of the city of Baltimore was created. This commission was authorized to proceed with the building of works and did so. The first appointments in the engineering organization were, however, not made until late the next year, in 1905.

On May 31, 1906, a report of the board of advisory engineers, Rudolph Hering, Samuel M. Gray and Frederic P. Stearns, was submitted on the best method of disposal for the sewage of the city of Baltimore. The construction of the sewerage system was officially begun on Oct. 22, 1906, and on Oct. 30, 1911, the Back River sewage-disposal plant was placed in operation. This plant, however, could treat only part of the sewage.

The elapsed time from the appointment of the first sewerage commission in 1893 to the beginning of operation of the sewage-disposal plant in 1911, treating only part of the sewage of the city, was eighteen years. By the end of 1912 the sewage-disposal plant had been completed so as to care for the sewage of 275,000 people, and by the end of 1914 the extension of the plant to care for a total of 600,000 people was substantially completed. The total elapsed time from the appointment of the first sewerage commission in 1893 to examine into a more perfect system of sewerage to the practical completion of the sewage-disposal plant in 1914 was 21 years.

Detroit—In 1912, under the terms of Art. IX of the treaty of Jan. 11, 1909, between the United States and Great Britain, the governments of the United States and of the Dominion of Canada referred to an international joint commission for examination and report the question of the pollution of boundary waters, and included in these waters was the Detroit River. On Jan. 16, 1914, a progress report was issued, which included a report by the sanitary experts employed by the commission. This report pointed out that the Detroit River was polluted by sewage discharged by the city of Detroit. This same year Detroit employed Clarence W. Hubbell to review the work and report of the international joint commission.

The second report of the commission appeared on March 8, 1916, and contained the report of the consult-

ing sanitary engineer, Earle B. Phelps, upon remedial measures. Five sewage-disposal projects for Detroit were studied and one of these projects was recommended. Hubbell's report, dated May 9, 1916, reviews the work of the commission and contains specific recommendations for the construction of sewage-disposal works.

Sewage disposal again came to the front in 1925, and on Jan. 5 of that year the mayor appointed a special committee "to study and report as soon as possible on the measures this city must take to solve this problem." This special committee retained Clarence W. Hubbell, Harrison P. Eddy and John H. Gregory as advisers, who, in a report dated Sept. 17, 1925, recommended the construction of intercepting sewers and sewage-disposal works. Their report was embodied in the report of the special committee, which was transmitted to the mayor in December, 1925.

On June 27, 1929, the board of supervisors of Wayne County, in which Detroit is located, appointed a special committee to report on sewage disposal for the county. This committee reported on Sept. 13, 1929, and recommended the construction of joint sewage-disposal works for the city of Detroit and adjacent communities in Wayne County. Following the Hubbell-Eddy-Gregory report in 1925, construction of intercepting sewers was begun and has since been proceeding, but sewage disposal is still being held in abeyance.

The elapsed time from the reference in 1912 to the international joint commission to investigate and report on the pollution of boundary waters to the present year 1931, with no decision yet as to sewage disposal, is nineteen years.

New York City—By a legislative act passed in 1906 the Metropolitan Sewerage Commission was created to study the conditions of sewerage and sewage disposal in the metropolitan district of New York and formulate a general plan or policy for protecting and improving the sanitary condition of New York harbor and neighboring waters. In 1908 the act was amended. The first report of the commission was submitted on April 30, 1910. In 1910 the act was again amended. The second report of the commission appeared under date of Aug. 1, 1912, and again, in 1913, the act was amended. The final report of the commission, containing definite recommendations for sewage disposal, is dated April 30, 1914.

The Wards Island sewage-treatment plant, the first large treatment plant to be built by New York City, was authorized by the board of estimate and apportionment on Dec. 5, 1927; the preparation of plans and specifications was authorized on Aug. 18, 1928, and bids for the first units were received on March 9, 1931.

The total elapsed time from the creation in 1906 of the Metropolitan Sewerage Commission to study sewerage and sewage disposal in the metropolitan district of New York to the receipt of bids in 1931 for the first units of the first large treatment works was 25 years.

Those who may be still further interested in the time required for cities to build and put in operation sewage-disposal works in consummation of previous recommendations therefor are referred to the report of the engineering board of review of the Sanitary District of Chicago, on sewage disposal, Part III, Appendix I, p. 3, wherein are given brief data relative to the sixteen cities in the United States, as noted in part in the accompanying tabular summary.

Practically all of the facts herein given have been taken from printed reports and other publications. A few statements are based on recent correspondence.

Principles of Financing the Privately Owned Water-Works

Long-term budgetary control is a necessity for efficient management

By V. BERNARD SIEMS
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ASSUMING that the purchaser of a water-works company has contracted to acquire it on the basis of a fair ratio of net earnings to the purchase price, he is faced by the necessity of formulating a financial plan for the new company taking over the enterprise. Since the issuance of securities of water companies is subject to the approval of the public utility commissioners of the various states, their established practices in dealing with securities applications are governing.

The principal point to be taken into consideration is the nature of the securities to be issued and their relative and absolute amounts. The basis of the total principal amount of securities that may be issued is the actual cost of the physical property, including such organization and overhead expenses as were incurred, to which should be added a reasonable allowance for working capital.

Distribution of Capital

Construction of the capital structure depends to a large extent on the earnings of the company and the necessity that the owners retain an approximate equity in the property. A nearly ideal division would be about 65 per cent of the total capitalization in bonds, 15 per cent in preferred stock and 20 per cent in common stock.

Since the earnings of public utility enterprises in general and of water companies in particular are, on the whole, remarkable for their constancy, a reasonable burden of fixed charges may be assumed in the form of bond interest. The issuance of first mortgage bonds makes it possible to obtain the greater part of the money for financing more reasonably than through the sale of stock alone. Such bonds may draw only moderately on the net earnings of the company for their interest; in fact, although there is no invariable principle established, the bankers, for the protection of the purchasers of these bonds, will insist that not more than half of the net earnings of the fiscal year shall be applied to bond interest. Such bonds can be conscientiously recommended to conservative investors and sold without difficulty.

The remainder of the capital required for the purchase of the plant and for improvements and extensions must be obtained from the sale of junior securities. These will consist mainly of preferred stock and, occasionally, of short-term notes.

Notes, as a rule, should not represent part of the financial plan at the time of such purchase, because, unlike those of an industrial concern, the assets of a water company are almost entirely fixed and not readily available for meeting a shortly maturing debt. The issuance of preferred stock should, therefore, be the almost universal rule, unless the assurance of rapid physical growth and a large increase in earnings make possible the payment of short-term notes by the issuance of long-term bonds or by stock. In cases where public relations of the company have been on a high plane recourse may confidently be had to a customer-ownership

campaign for the sale of the securities of the company.

To sell the preferred shares the margin of surplus earnings must be at least twice the annual dividend requirements. If the properties were acquired by the new company at reasonable prices, the proceeds of an amount of preferred stock meeting the above requirements will be ample to absorb the discount on the bonds and supply the company with sufficient money for the improvements of the first year.

Planning Future Expenditures

For future financing many companies today are adopting the budget system, which may justly be called the keystone of the financial planning and control structure. This budget should be prepared by the management, so that every department concerned with revenues and expenditures is made responsible for the actual results to be achieved. It is furnished, with a statement of the results accomplished every month, for the intelligent guidance of its activities and the checking of the judgment of the department head.

After establishing a budget for accurate estimates of revenues and expenditures, a permanent, simple and reliable control of the results must be installed. Whatever system is adopted, it is essential that not only the management but also the department heads receive the information monthly as soon as possible after the closing of the books.

Having thus formed a basis for the financial estimates of income and expenses and their application for the coming year, the next step in the fiscal planning is to determine the capital expenditures to be met in the ensuing year. It has been found by experience that the same method proposed for the operating budget should be employed for this purpose; through close cooperation of all the department heads and the management a composite plan of future improvements and extensions can be worked out, approved by the highest financial officials of the company and communicated to all persons to be held responsible for the carrying out of this plan.

The officers of the campany will then have before them an operating and a capital expenditure budget showing what they may expect to receive each month from the operations of the company and what will be required each month in the way of capital expenditures. These budgets will enable them to establish in advance the new capital needed each month and to make their financial arrangements accordingly.

Purposes of Reserve Funds

The problem of the use of reserve accounts requires particular study. On almost every balance sheet two reserve accounts will appear: reserve for renewals and replacements, commonly called depreciation, and a reserve for amortization of debt discount and expense. Other reserves in large numbers may be created to take care of extraordinary and unexpected expenses not provided for in the operating budget or to anticipate heavy expenditures chargeable to operations at some future date. Intelligently used, these reserves represent a very important adjunct to any budgetary control system, as they tend to flatten out the peaks and enable the company to control operations more easily. The much-discussed question of the relation of maintenance to depreciation and of these two to replacements can be simplified by stating the purpose of all three.

Maintenance expenditures are made to keep the physical properties in the highest operating condition so as to protect the integrity of the bonds and other securities held by investors. Other certain losses, however, will occur for which maintenance cannot provide, such as wear and tear, rust, obsolescence, etc. These factors are provided for under the general heading of depreciation.

Many indentures securing bond issues of public utility companies provide for the setting aside of certain percentages of the annual gross earnings to be credited to a maintenance and improvement reserve to be used for maintenance, repairs, renewals, improvements, additions and extensions. After deducting the actual amount spent for maintenance the remainder constitutes a reserve fund for renewals and replacements. In the budget providing for capital expenditures provision has been made for the statement of values of any parts of properties removed, together with their salvage value. In actual practice the value of property disposed of is charged to the renewal and replacement reserve, and the compensation for it is made available for capital expenditures. Against such capital expenditures, however, additional bonds may not be issued, since the new properties acquired with the proceeds of those disposed of represent substitutions for the protection of the securities originally issued. In addition, the renewal and replacement reserve offers an opportunity to set up out of earnings each year a reserve to be used for capital expenditures. With large and increasing gross earnings and other favorable factors a properly constructed and well-managed company can "plow back" into its business considerable amounts of its earnings through making improvements and extensions by these means, or retire outstanding securities for the purpose of substituting lower interest bearing bonds.

The reserve for amortization of debt discount and expense is provided to take care of the selling cost of the securities of the company, such as discount to bankers, the printing of bonds and legal opinions. These expenses cannot be charged to capital account but are usually amortized over the life of the bonds.

In conclusion, it may be emphatically stated that no company is too small to create a budget system, since it obviates guesswork and chance and provides the financial and operating officials with a definite plan for the control of the company.

Program of Public Works in Belgium

The Belgian government has a program of public works which, with other projects now under consideration, will involve an expenditure exceeding $100,000,000. The most important is construction of the Albert Canal, to link Antwerp directly to the River Meuse at Liége, work on which was started in 1930. The construction will take eight years and will cost $30,000,000. A tunnel under the Scheldt at Antwerp to cost $9,000,000 has been started. In Brussels a $20,000,000 plan is under consideration for reconstructing the railway system, involving the modernization and enlargement of the stations and the construction of a uniting line with six tracks and a station in the center of the city. Railway electrification is being investigated, particularly on the Brussels-Antwerp and Brussels-Luxembourg lines, and large orders will be placed shortly for new rolling stock for the various railroads. Rapid progress is being made in Brussels on the construction of the Charleroy Canal.

Acidity and Hardness Difficulties at Monongahela River Plants

By L. S. MORGAN
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WATER-PURIFICATION plants in certain sections of Pennsylvania, ordinarily equipped to provide for the satisfactory treatment of acid waters and waters of a relatively high hardness content, encountered special problems in these respects during the 1930 period of drought. As a result, unusual difficulties in purification-plant operation were experienced and the cost of treatment was materially increased. The value of the release of impounded water during low-water periods was clearly demonstrated.

Normal surface streams in southwestern Pennsylvania, when free from acid-waste pollution, are alkaline and of a moderate degree of hardness. Streams in the bituminous coal fields receive the underground drainage from many active and abandoned coal mines. Such drainage usually contains free mineral acids (sulphuric), acid salts (iron and aluminum sulphates) and calcium and magnesium sulphates. Mine drainage is, therefore, one of the sources of acid and hard water. Another source, to a lesser degree, is the "acid iron" waste discharged to streams from industrial establishments.

The Monongahela River receives large quantities of such acid wastes and is used as a source of supply at 22 public water-works in Pennsylvania. During low water this stream normally gives an acid reaction. The low-water period of 1930, however, extended from July through December; and during that time the acidity at some points was greatly increased, while at others it showed an actual decrease. The total hardness at all water-works on the stream was greatly increased.

The river was highly acid 25 miles above its mouth. Downstream from this point the acidity gradually decreased until it was actually alkaline near its mouth during the extreme low-flow period. This gradual reduction was not due to the inflow of alkaline diluting water from tributaries but was caused by the neutralization of the acidity, principally at industrial plants using large volumes of the river water and returning an alkaline water to the stream.

At one water-works, 35 miles above the mouth of the stream, the average alkalinity for this entire period was —72 parts per million to methyl orange. For the month of October the maximum alkalinity was —93 and the minimum —115 p.p.m., with an average of —102 p.p.m. The minimum alkalinity recorded during the low-flow period was —123 p.p.m. For the corresponding months of 1928, a recent average year, the average alkalinity was —11, the minimum —44 and the maximum 10 p.p.m.

At another water-works, 14 miles above the mouth, the average alkalinity for the 1930 low-water period was —26 p.p.m., with a maximum of —9 and a minimum of —142 p.p.m. The average soap hardness during the same period was 282 p.p.m., with a maximum of 520 p.p.m. For the corresponding period in 1928 the average alkalinity was —10 and the minimum —41 p.p.m. The average hardness in 1928 was 104 and the maximum 210 p.p.m. The lime-soda softening process is used.

At a plant taking water from the same source 4 miles above the mouth of the stream the average alkalinity was 1 p.p.m., the maximum 6 and the minimum —19 p.p.m. for the same period in 1930. The incrustant hardness, however, averaged 400 p.p.m. throughout the entire six months with a maximum hardness of 540 p.p.m. The average hardness for the same period in 1929 was 175, with a maximum of 370 p.p.m.; for the same period in 1928 the average hardness was 164 and the maximum 215 p.p.m. This plant uses the lime-soda softening process and usually reduces the total hardness to 90 or 95 p.p.m. This standard could not be maintained during the low period of 1930, however. The plant used as much as 27 tons of soda ash and 12 tons of lime a day to soften 14.3 m.g. of water, effecting an incrustant hardness reduction of 400 p.p.m. There is under construction at present a carbon-dioxide plant for recarbonization.

In general, the problems experienced by water-works officials at purification plants treating highly acid and excessively hard waters were:

1. Inadequate capacity of chemical-feed equipment.
2. Production of abnormal quantities of sludge.
3. Inadequate sedimentation-basin capacity.
4. Inadequate facilities for sludge removal.
5. Shortened filter runs.
6. Increased cost of treatment.
7. Failure to effect satisfactory reduction in hardness to meet adopted plant standard.

The first of the troubles outlined was readily overcome. Some plants normally having adequate equipment for feeding chemicals to the water found it necessary to secure additional equipment. Excessive sludge production was experienced at many plants. Sedimentation basins became excessively loaded with sludge and, without proper facilities for continuous sludge removal, capacities were seriously reduced. Frequent cleaning became necessary in order to afford full basin capacity and satisfactory retention periods. Filter runs were reduced in some instances to a few hours, necessitating frequent filter washing and increasing materially the amount of washwater used. This was due principally to the formation of a light floc, which in the absence of turbidity did not readily settle and was carried over to the filters, producing a thick filter mat in a short time. Increased cost of treatment was due principally to the increased amount of chemicals used. At one large plant the cost of chemicals alone for 1930 was more than double the cost for any previous year.

The value of storing water during abnormal periods of runoff and its release during periods of drought was very clearly demonstrated on this watershed during the low-water period. A private company operates a large hydro-electric power plant on a major tributary of the Monongahela River. The reservoir in connection with the plant impounds 72,000 acre-ft. of water. Through negotiation between the company and federal authorities arrangements were made to withdraw water from behind the dam to maintain navigation on the river. Approximately 50,000 acre-ft. of water was withdrawn between July and December. It was slightly alkaline and relatively soft and forestalled more serious conditions.

These experiences raise the question as to whether future treatment works should be so designed and constructed as to be able to meet conditions such as those experienced during the 1930 low-water period. In Pennsylvania the Bituminous Coal Mine Drainage Board, consisting of representatives of the bituminous coal industry and of the Sanitary Water Board, is making a study of the acid mine drainage problem to determine reasonable and practicable means for the treatment, control or regulation of these waste waters at their sources.

Economic Balance in the Construction of Water-Works Extensions

Aim should be to complete new units just as need appears — Early or late timing means added expense or inconvenience to consumers

By L. R. HOWSON
Alvord, Burdick & Howson, Consulting Engineers, Chicago

COMMUNITY GROWTH brings increased demands for water supply. It also brings continually changing problems and in many cases requires new facilities for their solution. With the added knowledge and the broader possibilities offered by a longer backsight, solutions of community problems are occasionally found desirable that would have been entirely impracticable at an earlier period. More commonly, it is found that many mistakes and unwise expenditures could have been avoided by comprehensive studies of requirements and the determination of an economic program to meet those requirements as they matured. Obviously, a forecast for the future is susceptible to error, but if the studies are periodically reviewed in the light of actual conditions, as compared with previously forecasted requirements, they become the basis for a sound economic development.

The average American water-works involves an expenditure of approximately $50 per person served. Accordingly, as a general average, every time 10,000 people are added to a community approximately $500,000 is required to maintain the adequacy of the water-supply service. These construction requirements, when not sufficiently distributed, frequently result in inability to finance from current rates and involve costly delays and inefficient service during the period in which the necessary financial arrangements are being perfected.

A comprehensive survey of existing facilities and their deficiencies for present and prospective requirements is the only practicable means of avoiding, on the one hand, excessive obsolescence and the superseding of investment prior to its having served its full useful life, and, on the other hand, the extravagance and high costs incident to the construction of works before they are needed. As either of these conditions involve losses that must be collected from users of the service, an economic loss to the community must result.

It may be taken as axiomatic that: (1) any water-works in a growing community that builds only for present needs is habitually unable to meet them; and (2) any water-works developed for a period too far in the future is placing an unnecessary economic burden upon its consumers, both present and future. Between these two extremes lies the orderly development of a construction program so coordinated as to permit the utility to furnish adequate service at all times, with construction expenditures incurred just before extensions become necessary, and with the minimum of adjustment in the rate structure for financing.

Comprehensive Planning is Practicable

Water requirements, in most instances, depend primarily upon population growth. It is possible to forecast with reasonable accuracy the probable growth of a city, its water requirements for fire and domestic purposes, the probable area to be served and the size and general location of feeder mains for the next ten or twenty years. These requirements being determined for various periods, it is then practicable to compare available sources of supply as to adequacy, cost of development and quality, and to select that source best adapted for any particular development, determine its ultimate desirability and arrange a comprehensive water-supply program.

Such a study will sometimes show the desirability of developing a temporary supply, to be abandoned later. At Gary, Ind., when the Illinois Steel Co. started its development in 1906, a shallow well supply was constructed with the idea that it would be supplanted by a lake intake on which the deferred fixed charges would exceed the cost of the abandoned well supply. Similarly, the time can readily be determined when additional pumps, filters, storage reservoirs, feeder mains and other works will be required. The plan should determine the direction of growth of structures and the economical provision for future equipment.

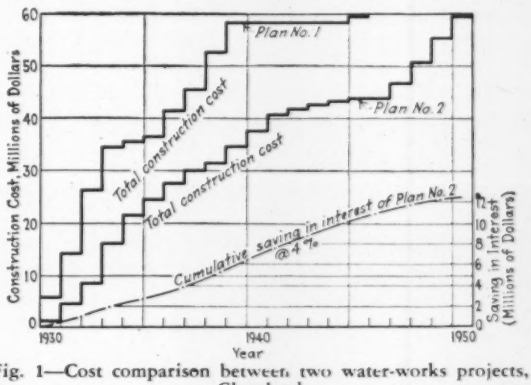


Fig. 1—Cost comparison between two water-works projects, Cleveland

Advantages of Advance Planning

The average income of water-works properties throughout the United States ranges from $6 to $6.50 per capita. Of this total approximately $4 represents fixed charges; that is, interest and depreciation. The cost of operation accounts for only 35 to 40 per cent of the total income. It is apparent, therefore, that any program that will result in a more uniform rate of capital expenditures and the installation of betterments just prior to the time at which they are needed has a direct bearing on the factor, which amounts to nearly two-thirds of the cost of water to the consumer.

A specific illustration of the effect of two construction programs upon the cost of water to the community is available from a recent study by a commission of engi-

neers for the water department of Cleveland, Ohio. This commission was asked to study a program then under consideration involving an expenditure of approximately $60,000,000 in a ten-year period and to propose any desirable revisions, taking into full consideration the necessity of financing the improvements from rates. (Under the Ohio law municipalities are permitted to issue bonds for water-works construction without such bonds being charged against the indebtedness to the city, provided the income of the water-works is sufficient to carry fixed charges and retirement expenses on the bonds, in addition to the operating expenses.) During the commission's studies the 1930 census figures became available, a revised estimate of future population and water requirements was made, and each part of the water-

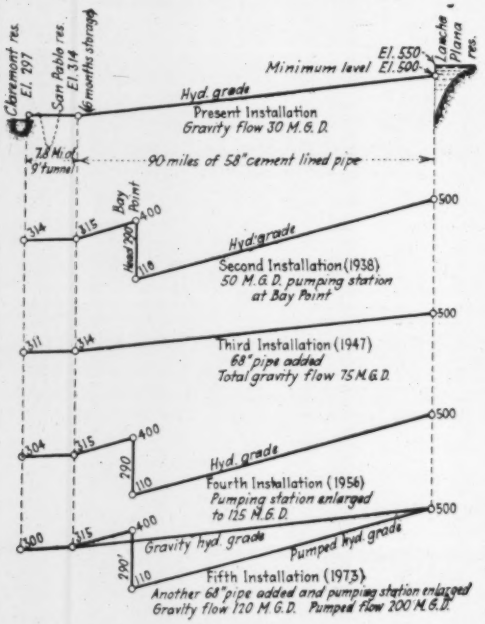


Fig. 2—Stages of Mokelumne River project

works (such as intakes, filters, pumping stations, feeder mains and reservoirs) was analyzed as to the present adequacy and the time at which additions would be required. The city is now served by two tunnel intakes into Lake Erie and two filtration plants, having a total capacity of 315 m.g.d. The plan reviewed included the addition of a new intake tunnel, pumping station and filtration plant on the east side of the city to be completed by 1935 (capacity 200 m.g.d.), and similar construction on the west side to be completed by 1939. The latter was to have an ultimate capacity in 1960 of 150 m.g.d., only 75 m.g.d. of which was to be completed in 1939. The commission found that through the utilization of existing adequate cross-town feeder mains, it was possible to shift the territory served by the existing stations farther to the west and thus defer the construction of the westerly plant until after 1950. This resulted in saving the fixed charges on the $6,000,000 west-side intake for that period. The revised construction program will save over $12,000,000 in interest alone prior to 1950. Including retirement expense, $20,000,000 was saved to the water consumers, or an annual average of $1,000,000. This is 25 per cent of the present gross income of the water department. The rate at which expenditures were contemplated under the two proposals is shown in Fig. 1. Plan No. 2, which was adopted, can be financed entirely from a moderate increase in the present low water rates.

In Chicago a peculiar situation is found, in that the present water-works system is incapable of maintaining pressures during periods of heavy demand; yet should the city install universal metering, it would be overbuilt from a water-works standpoint. The existing intake tunnels, pumping stations, feeder and circulating mains would be adequate for the next 30 years if water waste could be eliminated. The average per-capita pumpage in Chicago at the present time is 310 gal. per day. Furthermore, in the election of November, 1930, the people of Chicago expressed a desire for filtered water. Plans are already in progress for the construction of filter plants, but to build such plants in advance of waste restriction would involve the expenditure of $30,000,000 to $40,000,000 more than would be required if waste restriction preceded filtration. Filtration works designed for present wasteful conditions would be adequate for the next 30 years if waste were to be curtailed. It has been estimated that Chicago would save over $200,000,000 in the next 20 to 30 years by a comprehensive plan of waste restriction.

Present Worth of Deferred Expenditures

Through a comprehensive and well-formulated construction program it is usually possible to time successive additions so as to keep the present worth of all expenditures at a minimum and to collect the fixed

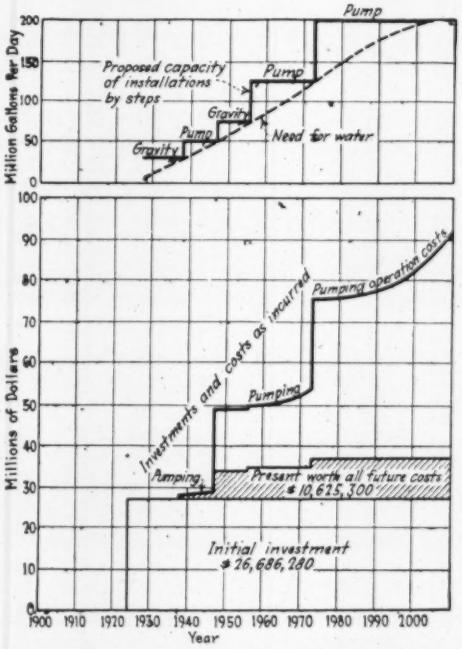


Fig. 3—Progressive capacity and cost of Mokelumne River project

charges from those who use the service and benefit therefrom. A typical example of a well-developed plan of this type is found in the Mokelumne River project of the East Bay cities, near San Francisco, Calif. This supply is considered adequate until at least the year 2000. One of the principal items of expense is a 90-mile conduit which will carry, according to present estimates, 30 m.g.d. in 1938, 50 in 1947, 75 in 1956, 125 in 1973 and 200 m.g.d. in 2000. To provide at this time a capacity of 200 m.g.d. would involve an expenditure of $50,000,000, placing a prohibitive expense on the 30

m.g.d. now sold. A program was therefore worked out that provided for a single 30-m.g.d. conduit in 1926. When, in 1938, the friction in this line becomes excessive, a booster pump will be installed. By 1947, when the flow reaches 50 m.g.d., the cost of pumping will exceed the fixed charges on a second conduit, which will then be built and the two lines operated by gravity until 1956, when boosting of pressure will again be adopted. In 1973 a third conduit will be installed to provide up to 125 m.g.d. by gravity flow or 200 m.g.d. if boosted. By this procedure the initial conduit investment was but $14,000,000, and the present worth of the entire conduit program but $24,500,000. Present water users are saved approximately half the fixed charges, and future expenditures will be paid for by those using the water. The hydraulic profile illustrating this conduit program is shown in Fig. 2, and the relation between progressive capacity and costs is shown in Fig. 3.

In contrast to the Mokelumne project is the one planned for Los Angeles. With a present population of 1,850,000, a system costing $200,000,000 must be built practically in its entirety. The fixed charges must be borne largely by a population only 25 per cent of that which the project is planned to serve ultimately.•

Future of Facilities

A comprehensive plan of water-supply development must not only furnish water, but it should do this at the least annual cost. It therefore involves comparisons between such alternatives as storage in reservoirs versus filtration-plant capacity; storage versus pumping equipment and feeder mains; and booster pumps for increasing pressure during hours of peak demand versus larger mains. At many cities where topographical conditions are favorable large storage capacity is economically justified by the saving in filtration works, pumps and large mains. At Cleveland, it has been considered desirable to provide storage for 24 hours' average daily pumpage. The Cincinnati program involves two-day storage. Louisville is installing high-service storage for 16 hours and will have a total storage in its clear-water reservoir and high-service reservoir of about 30 hours. St. Louis has high-service storage of one day's supply. In cities where storage must be provided in elevated steel tanks, from one to four hours' capacity is usually justified by a comprehensive study.

With rapidly growing communities, where there is less backsight available for an accurate forecast and where changing conditions may seriously affect the rate of growth, it is generally desirable to build for shorter periods in the future than in communities that have a long history of uniform growth. It is, however, in communities of the first type that the value of a comprehensive program is most apparent. Unless the plans recognize the probable large ultimate requirements, mistakes in judgment will soon become apparent through the early obsolescense of unwisely located structures. On the other hand, if works are built sufficient for several years in advance, a slowing up in growth may make them unnecessary and thus saddle the community with fixed charges on unused property. The remedy lies in a carefully prepared plan capable of being expanded in units to the most optimistic estimate of ultimate needs, but with each unit added only just prior to the time when the need is demonstrated.

An illustration of this feature is in the preliminary designs for supplying some thirty suburban districts around Chicago with a unified water supply by means of a large 30-mile distributing main. The population in this district has doubled each ten years for the past three decades, but in the last two years there has been a marked slowing up. It was deemed economical to design the pipe line for the quantities that it will probably carry about ten years after construction. When the pressure drop becomes too great with increased quantities, a booster station will be installed at the middle of the line, to be followed later by two additional boosters at the quarter-points. Still later, when the cost of operation of the three stations shall exceed the fixed charges on a duplicate pipe line, a second line will be built. Such procedure will result in a material saving in annual cost, keep the capital expenditures to a minimum until the needs and revenues are actually ascertained, and thus facilitate financing.

Finance an Important Element

Every water-works, whether privately or publicly owned, should be self-supporting. With municipally owned water-works most states require that bond issues for construction purposes be amortized in from 20 to 30 years. With a definite construction program it is practicable to develop a coordinated financial program by which the cost of water (made up of operating expenses, interest and sinking fund) can be kept commensurate with consumption. The rate schedule should then be adequate to cover the minimum revenue requirement. In other years, when the demands are somewhat lower, the revenue should be reduced by increasing the discount rate and thus maintaining charges at the cost of service.

An excellent example of a comprehensive program financed from plant earnings is afforded by Racine, Wis. The property as acquired by the city in 1919 was deficient in intake capacity, the pumping equipment was inadequate and inefficient and, as there was no filtration, the quality of the water was poor. The water commission had a comprehensive study made of the water requirements, the existing property and its deficiencies, the most practicable methods of rehabilitation, the expenditures that would be required and the order in which they should be undertaken. The ten-year program then developed required an estimated expenditure of $1,935,800. The first construction was a coagulating basin, which provided a material improvement in the quality of the raw lake water and at the same time relived the intake of peak rates of draft. This was followed progressively by a 36-in. intake 7,000 ft. out into Lake Michigan, a 12-m.g.d. filter plant, a 3,000,000-gal. low-service reservoir and a 2,750,000-gal. high-service standpipe. Bids are now being taken on an electric pumping station, an 8-m.g.d. extension to the filter plant and a service building. Thus Racine has changed from a very inadequate raw-water supply to an excellent filtered supply adequate for the needs of a rapidly growing industrial community and without the financial strain frequently incident to an increase in plant investment of about 150 per cent. All the improvements have been financed from earnings.

Louisville has for many years financed new work wholly from earnings, operating under a rate schedule in which the discount rate on the consumers' bills is varied from 10 to 33 per cent, depending upon construction requirements. The base rate remains constant. Under this plan an 84-m.g.d. filter enlargement, several miles of 48-in. feeder mains, electric low-lift pumping and steam high-lift pumping additions have been financed. At the present time a 30,000,000-gal. reservoir and 6 miles of 48-in. and 60-in. pipe are to be built.

Checking Past Population Forecasts

Study of 50 engineering reports shows tendency to overestimate municipal growth—Magnitude of error greater for small communities—Past records are not the sole criterions for accurate results

By NATHAN B. JACOBS and ARTHUR W. SKILLING
Vice-President and Assistant Engineer, respectively, Morris Knowles, Inc., Pittsburgh, Pa.

POPULATION forecasts made in past years for a number of American cities, when checked against the actual enumerations made in 1930, show a tendency to overestimate future population growths. The errors in prediction range from 118 per cent in the case of the small community of less than 10,000 to only 3 per cent for New York City. However, a much smaller error, only 4.1 per cent, is involved between the aggregate population predicted for 50 cities and towns covering one-sixth the population of the country and the corresponding total reported by the 1930 census. In general, forecasts for the larger cities have been far more accurate than those for the smaller municipalities.

The first problem facing the engineer engaged in investigation for a new or additional water supply is the quantity of water that will be needed. Water supplies are commonly planned to meet the requirements of some 20 to 40 years in the future, so that the first step in the problem is the determination of expected population. The importance of meeting this problem squarely and solving it on a conservative basis is self-evident.

Forecasts that later prove to have been too low make it necessary to supplement the water-supply works earlier than had been anticipated. Estimates that overstate populations commit municipalities to expenditures for works beyond what may have been determined as the economical limit, and water-supply capacity in excess of requirements lies unused, while taxpayers bear the carrying charges on the investment that it represents. Forecasts that are wide of the mark, therefore, are the potential seeds of serious consequences, and it is the aim of every engineer to keep his forecast within reasonable limits of error.

The 1930 census gives an opportunity to check back on forecasts of former years and measure the accuracy of the estimates then made. Using a group of 50 water-supply reports, 26 of them by Morris Knowles, Inc., and the other 24 available reports by other engineers, a review has been made comparing the population forecasts in these reports with the 1930 census figures. The reports cover municipalities of various sizes from New York, with its 6,930,445 population, down to the village of Carrollton, Ohio, with 2,286. Some reports are very old, the New York report, for example, having been made in 1900, while others were made since the 1920 census.

Population estimates from these 50 water-supply reports showed an aggregate of 19,595,075, as against 1930 census figures of 20,393,674 for the same cities, towns and districts, representing an error in prediction of 4.1 per cent. Covering as they do about one-sixth of the population of the United States and 50 individual estimates, these reports may perhaps be considered representative of engineers' work in forecasting populations. Their success, however, cannot be gaged by the combined figures just given. Errors are compensating, and some grave discrepancies between census figures and forecasts are hidden in the process of averaging. Among the estimates were two that were more than 100 per cent in error.

TABLE I—ERRORS IN POPULATION FORECASTS FOR 50 AMERICAN CITIES

Population	Communities in Group	Error in Forecasting Population in Per Cent		
		Average	Greatest	Least
Less than 10,000	8	46	118	11
10,000—25,000	10	5	60	7
25,000—50,000	9	15	38	2
50,000—100,000	6	27	49	4
100,000—200,000	7	21	32	4
200,000—500,000	4	32	72	5
500,000—1,000,000	1	13		
More than 1,000,000	5	6	8	3

Preponderance of Overestimates

The most striking thing about the forecasts is the preponderance of overestimates. Of the 50 predictions 41 are in excess of census figures. This seems to show that the usual engineering practice is to allow amply for population growth, although it may be that the intervention of the war, restriction of immigration and changed economic conditions are the real factors involved.

In a comparison of engineers' estimates of population with census counts in *The American City*, September, 1928, p. 124, G. C. Houser found that out of 56 predictions, 43 were overestimates and 13 were underestimates, on the basis of the last census year to which the forecast extended. Mr. Houser used a different set of reports from the 50 here under consideration, and his comparisons were with the 1925 state census counts in Massachusetts and New York and the 1920 federal census in other states.

Small Communities More Difficult

Grouping the 50 predictions into classes of cities according to size, the difficulty of making predictions for the smaller communities is apparent. In Table I eight predictions for places having less than 10,000 persons had an average error of 46 per cent. It was in this class that both of the errors in excess of 100 per cent occurred. In sharp contrast is the small percentage of error encountered with cities or metropolitan districts of more than 1,000,000 population. One of the classic examples of this kind of prediction is the work of John R. Freeman in his report on the New York City water supply. His estimates were made in 1900 before the census for 1900 was available. For the year 1910, his estimates was only 6.5 per cent less than the census enumeration; for 1920, it was less than 2 per cent in error, while his estimate for 1930 differs from the census figures by only 4 per cent.

It is interesting to note the revision of estimates that is made necessary with time. In the case of the Boston Metropolitan Water District, estimates of future population were made by the late F. P. Stearns, in his report on metropolitan water supply dated 1895, prior to the formation of the district. Subsequent estimates were made in 1922 by X. H. Goodnough, reporting on "Water Needs and Resources of the Commonwealth," and, in 1925, by the late Leonard Metcalf on a "Special Investigation of Requirements of the Metropolitan District." These three estimates are shown in Fig. 1 with the 1930 census count for the district involved.

While these estimates called for a general revision downward, estimates for the city of Detroit underwent revision in the opposite direction. A forecast by C. W. Hubbell in 1916 estimated the 1930 population at 1,250,000. Another in 1919 by the late R. W. Pratt placed it at 1,420,000. George H. Fenkell's estimate in 1923 estimated the 1930 population at from 1,600,000 to 1,800,000. The census count (1,568,662) was close to Mr. Fenkell's lower estimate.

Method of Forecasting

In all of the 50 predictions reviewed the method was universally one depending either in part or in whole upon the population history of the community for which the prediction was being made. On p. 288 of the Freeman report on New York there appears the following statement:

> The future population . . . can be estimated . . . by a study of the growth for the past 30 years.

Mr. Freeman was cognizant of the greater adherence to steady rates of growth for the populations of large areas, for he says:

> The great commercial center of our country, reflecting as it does the progress of the nation as a whole, must move onward with a more definite, uniform and persistent force than the growth of a smaller city dependent upon the prosperity of a few lines of industry or a limited commerce.

Possibly the figures in Table I, reflecting the larger errors in the predictions for communities of less than 10,000 population, are evidence of too great a reliance placed by engineers upon past trends in rate of growth. In these small communities the records are generally meager, and the engineer who depends chiefly upon this method falls into large error, as the table shows.

The population of the United States as a whole has been one of regular growth, as is shown on Fig. 2. Based upon this regular increase, as exhibited over a period of 140 years since 1790 when the first census was made, students of population are in close agreement in estimating the population of the United States at 1970. Professor Raymond Pearl of Johns Hopkins University estimates it at 167,000,000; P. K. Whelpton of the Scripps Foundation, Oxford University, Miami, Ohio, at 171,460,000; and William F. Ogburn, president of the American Statistical Association, at 175,000,000. E. N. Widen, general commercial engineer of the Southwestern Bell Telephone Co., estimates the population of the United States at 146,000,000 in 1950.

Large Areas Used as Controls

The steady and consistent rates of growth exhibited by large populations and exemplified by the growth of the United States offer an opportunity to the forecaster to make use of these in application to problems involving smaller units of population. Basically, forecasting for a large area affords a control to which the population of its sub-areas may be adjusted. In addition, the population of a city may be expressed as a simple ratio of the population of the state or other large area of which the city is a part, and the history of this relationship studied. If conditions warrant, the ratio may be projected as a guide to the eventual forecast for the city itself. There might need to be adjustments or departures from past ratios. Only the exercise of judgment will determine the best procedure for the individual case. A straight graphical extension of simple ratios should be avoided, but there is an opportunity here for engineers to make use of a yardstick in forecasting, which they have hitherto not used extensively. Nation-wide population forecasts have been used in this way for control purposes by the Bell Telephone Co. in its extensive population studies. The writer's office has found it helpful in a number of cases. In some recent population forecasts

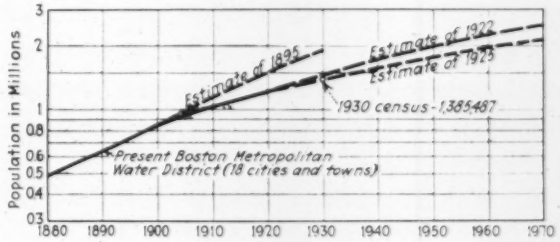

Population in Millions
Estimate of 1895
Estimate of 1922
Estimate of 1923
1930 census - 1,385,467
Present Boston Metropolitan Water District (18 cities and towns)

Fig. 1—Population estimates of Boston Metropolitan Water District

Excludes Newton and Brookline

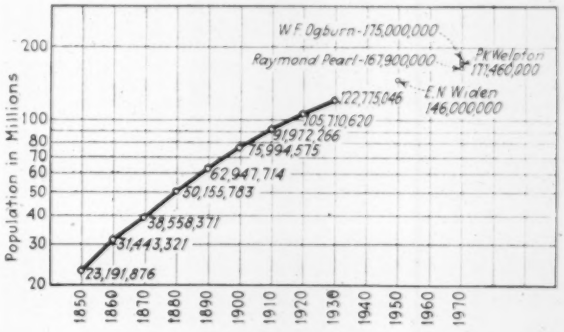


Fig. 2—Population growth of the United States

Showing estimates for 1950 and 1970.

for the Boston Metropolitan Water District the population of the district was controlled by estimates for the eastern and western parts of Massachusetts, for the state as a whole, for New England and, finally, for the United States. The method involves a study of the past ratios of the populations of these several areas, consideration of economic factors for possible adjustment of future trends and a projection of ratios in accordance with the dictates of judgment based on all relevant factors.

The Most Frequent Problem

The problem for the majority of engineers is the prediction of population in communities whose size does not guarantee any continuation of past rates of growth, and it is by his predictions for individual communities that the engineer's success or failure is measured.

The census of 1930 emphasizes the danger of too much dependence upon past population trends in any individual community and the importance of supplementing mathematical and graphical forecasts with sane judgment. Taking only the cities which, by the 1930 census, had a population of 25,000 or more, there are twenty

cities that actually suffered a loss in population between 1920 and 1930. These represent the real problems for engineers engaged in providing adequate future water supply and charged at the same time with the responsibility of committing the municipality to an expenditure no greater than is reasonably necessary to maintain adequate capacity. Of the twenty cities that lost population between 1920 and 1930 eight were in Massachusetts, and three of these were cities of more than 100,000 population. In spite of the loss of population in eight of its large cities, Massachusetts registered a gain in population of 10.3 per cent for the decade. In these cases the ratios of city to state would have required substantial adjustment to meet actual developments. These are the extraordinary cases. They abide by no laws of growth, yet they destroy none. Because these cities have defied forecast does not prove that the application of logical methods to the problem is without avail. They stress the importance of care in handling the problem.

Factors Other Than Past Trends

The departure of these cities from past growth trends points to the importance in forecasting of the use of what has been called "the imagination to grasp the significance of apparently trivial events." Often there are changes in a city's industrial structure that are so recent as not to have affected a statistical series built up out of past population records. Thus, in the case of Lawrence, Mass., the city has felt the effect of the depression in the textile manufacturing business for a number of years past. The 1920 census recorded a retarded rate of growth compared with that of previous decades, but there was no indication up to that time that a decrease in population might be expected in the following decade. The real falling-off in textile activity began after the 1920 census, too late to make its effect felt on the census of that year. At the same time it was an important factor to be reckoned with in forecasting for the city, and a factor that was not fully revealed by any growth trend in the city's population history.

Periodic Check-Up Necessary

The lesson to be learned from the publication of the 1930 census figures, as indeed from any federal census, is the importance of revising past predictions and replanning in the light of the new knowledge that the census figures give. This involves an obligation on the part of the engineer to present fully in a report upon a proposed project a statement of population predictions and other factors used in the determination of the ultimate expected use of water. In long-time predictions intermediate estimates are important for this check-up. The municipality that has been provided with a water supply estimated to be good for 40 years should ascertain at the end of the first ten years to what extent the growth of the community has conformed to the plan upon which the water supply is based. There is a reluctance on the part of city officials to be prepared for an increase in population in excess of the engineer's predictions. An engineer's report that carefully sets out the premises of his forecast should frankly dispel any sense of false security in the forecast and prepare the municipality for the necessity of a periodic check-up to maintain the adequacy of its water supply.

Design Limits in Providing for Peak-Load Consumption

By ELMER G. MANAHAN
Consulting Engineer With Fuller & McClintock, New York City

As CIVILIZATION becomes more highly developed, standards for basic services, such as those rendered by a water utility, rise rapidly. What was once sufficient in the way of pressure, quantity and purity no longer meets the demands of the public. Continuity of service must always be assured. Ability to meet peak-consumption rates is expected. A higher grade of service in every particular must be provided by the designer. Just how far these demands may be met practicably is discussed in succinct form by Mr. Manahan. Briefly, he sets up the four factors that cause peak loads and then indicates that experienced judgment is the main aid in gaging just how much service the public can be made to pay for.
—EDITOR.

OBVIOUSLY, the extent to which the public will pay for the facilities to care for peak or infrequent demands tells the designer of a water system how far to go in meeting such maximum conditions. This statement, however, merely changes the form of his question. Since, unfortunately, free disposition to provide funds is far from natural, he must determine to what extent the public is willing to pay for taking care of the peaks, or rather, how far the public can be made to realize that it must pay.

Clues to the answer are vague and unsatisfactory. The public is becoming more and more insistent upon getting what it wants when it wants it. It grows more and more impatient with restriction in service. The public is becoming not only better able to pay for what it wants, but more willing, or less unwilling, to pay. The public is becoming better educated as to what constitutes a waterworks and no longer regards it as merely a network of street mains. But the public will continue to stand a moderate amount of pinching, though not without growling, before it becomes fully willing to pay. Furthermore, the public does not realize, though the designer knows well enough, that it costs a lot more to take care of peak loads than it does to provide for normal service.

This hazy evidence justifies, on the whole, the making of more liberal allowances for peak loads than have been warranted in the past, whatever that may mean. It also indicates that to try to provide for all peak loads, however great and whatever their cause, is not necessarily sound policy.

Four Reasons for Unusual Demands

What causes peak loads? Four causes may be mentioned. Best known perhaps, because most widely felt when it does occur, is the demand due to extremely dry and hot weather, especially when accompanied by actual or threatened deficiency in supply. Then there is unexpected growth of communities in direction, character and amount. Again, certain parts of the system fail to function as intended, as in the case of breakage of mains or enforced shutting down of machinery or other facilities. Fire service for large fires furnishes the fourth cause.

Summer Peaks—As regards peak demands due to very hot, dry weather, a well-balanced water-works system

should be so designed as to meet them fully, except in very rare cases. The first step toward a remedy should be the reduction of possible waste. In extreme cases reasonable temporary curtailment of supply for purposes not absolutely necessary, such as for lawn sprinkling and washing automobiles, may be adopted; but the occurrence of such a need, or even the likelihood of its occurrence, shows clearly that the system has been outgrown and that immediate enlargement should be undertaken.

The meeting of peak demands of this class is, therefore, only secondarily a matter of design. It first requires quick action in procuring necessary funds. Then design and construction of extensions to the works must follow promptly before faulty service has unduly tried the public temper.

Unusual Growth—When planning new works or extensions of existing ones, the direction of growth of the community, the relative density of future population in different localities and the number, character and location of future industrial plants is conjectural. No wizardry exists to enable the designer to forecast accurately what future demands may arise from massing of population and from industries. Whenever and wherever such peak demands occur, the designer is justified in providing fully for them, but this, again, is first a matter of action rather than of design, and the remedy lies in providing for such demands in season to avoid hardship. Full justification for providing ample facilities for meeting peak loads imposed by factories is found in the fact that lack of such facilities may cause niggardly treated industries to seek their own sources of supply or to locate elsewhere.

When in reasonable doubt as to how great may be the peak loads from local concentration of demand, the designer is warranted in providing larger mains than he would ordinarily plan to serve the needs of the locality. Large mains cost less in proportion to the service they render than do smaller mains of equal capacity.

Out-of-Service Loads—The occurrence of abnormal peak loads upon remaining units, when parts of the machinery, boilers, filters or other equipment subject to occasional or periodic repair or cleaning may through necessity or accident be temporarily out of service, must be fully guarded against in design by providing ample reserve units. Frequent interconnection of street mains, properly controlled by valves, must always be made. Having provided for such necessities as these, the designer should first use remaining funds where the most good can be accomplished at the least cost. Extensive construction, such as that of parallel mains or additional reservoirs, though desirable, is costly, while certain inexpensive possibilities are sometimes neglected. For instance, the arrangement and means of control of piping for pumps and boilers may often, at little additional expense, be improved so that when any part of the piping or any unit of the equipment is out of service maximum service from the remaining piping and units may be obtained. The same applies, in part, to intakes and reservoir outlets. Another example is the provision of sufficient piping capacity in purification plants to permit all parts of a plant to take maximum overloads, thus avoiding the expense of constructing additional units in order to provide for peaks.

Fire Demands—Often in small water-works systems it is not economically possible to provide a supply from more than one source, or to construct more than one supply main from the source to the center of distribution. It is also difficult in a community which branches out in several directions, as along valleys of intersecting streams, to furnish more than a single feeder main for each section of the community. In such cases, where the expense of providing against failures would be great, the designer must seek justification for installing additional facilities by balancing their cost against the losses that might result from lack of them.

In general, if the designer provides a water-works system that deserves a fairly high rating under the standard grading schedule of the National Board of Fire Underwriters, he will have provided against peak loads, not only from fire demands but from most other causes, to as great an extent as is warranted. Whether he should go as far as this depends upon his judgment as to what the public can be made to pay. In any event, this grading schedule furnishes an excellent guide.

In summary, the designer, in providing for peak loads, is justified in going just as far as, in his judgment, the temper of the public dictates. Often the decision regarding such provisions relates to when, rather than what, to provide. The designer is always justified in making, and should seek to make, provisions that accomplish much in proportion to their cost. If he is guided by the practice of the National Board of Fire Underwriters, he can hardly be subjected to criticism, except that he may have spent more freely than the public desires. And finally, there are few if any gadgets available to meet peak loads. What is required of the designer, beyond moderate experience, is judgment, and then more judgment.

New Railway Terminal at St. Louis

To improve its terminal facilities in St. Louis, Mo., the Illinois Terminal Railroad System is building a double-track elevated and subway line from the McKinley Bridge to a new 20-story freight station and warehouse building, with an additional passenger and freight station at High St. and Washington Ave. This new line, about 2½ miles long, will replace the present surface line that is of about the same length but laid in city streets and on a different location, although a part of the latter, near the terminal, will be retained in order to serve an industrial zone and several new team tracks. The railroad company operates about 80 miles of steam and electric lines in the industrial area on the east side of the Mississippi and also serves some 500 miles of electric lines through central Illinois, giving access to the St. Louis terminals over its McKinley Bridge.

From the west end of the bridge there will be about 1.6 miles of double-track steel viaduct, the line coming down to street grade for a short distance along the river front in order to reach a freight yard for interchange with the Terminal Railroad Association of St. Louis, which serves all the railroads entering the city. The viaduct comes down to street grade again about two blocks beyond Cass Ave., where it connects with the present surface line. It then enters the new subway, which is about 0.6 mile long and ends in an underground universal freight station having ten tracks with capacity for 125 cars. There will be eventually a maximum of four passenger tracks. This subway, built by open-cut construction, is of steel frame with concrete roof forming the new deck at High St., being widened by the city.

The railroad construction is under the supervision of James A. Hooke, consulting engineer. The firm of Mauran, Russell & Crowell is architect for the building. The cost of the development is estimated at $15,000,000, and it is expected that the railroad, freight station and warehouse will be in operation by 1932.

A Service Building for Public Utilities

Special requirements of the water, gas and oil departments of the Metropolitan Utilities District, Omaha, control the design of a new service building—Sleeping quarters provided for emergency repair gang—Organization of work described

By THEODORE A. LEISEN
General Manager, Metropolitan Utilities District, Omaha, Neb.

VISUALIZING the possibility of improved service at lower cost through a consolidation of facilities, the Metropolitan Utilities District of Omaha, Neb., recently decided to construct two new buildings, one to contain administration offices, the other for the accommodation of all service branches. The latter is of unusual interest, since it provides ample and well-planned space for the storage of materials, meter repairs, automobile storage and repair, shop offices and a complete apartment for the accommodation of an emergency crew. Adjacent to the service building is a yard for the storage of cast-iron pipe, large gate valves, special castings and other cumbersome equipment, some of which is housed in two old foundry buildings on the tract. This storage yard is a great convenience, for before its acquisition the pipe yard was located at an abandoned pumping house remote from the service building and from parts of the city where the material was most likely to be used.

As this article is intended to be devoted primarily to water-supply activities, reference to the gas and ice departments of the District will be made only when necessary in describing the uses and facilities of the service building, for as the building was designed for use of all departments the other two cannot be ignored entirely in any adequate description of its functions.

Prior to March, 1927, the office of the water department was located in the city hall, in quarters somewhat cramped, unsatisfactory and unsuited to efficient conduct of the business. The storehouse and service department were located in a rented building even less suited to the requirements than were the office quarters, and the automotive equipment was housed in some antiquated buildings, originally the home of the old abandoned gas-works. The gas office also was located in another rented building. With the forces distributed in different parts of the city, the coordination of activities was extremely difficult and results unsatisfactory, so the logical conclusion was to make provision for quarters designed to meet the needs of the different departments in a manner commensurate with modern business methods.

Site—The site selected for the service building lies on the easterly side of Twentieth St., near Center St., being part of the property acquired through the purchase of the gas-works. The lot extends east to Nineteenth St., a narrow lane carrying the railroad siding that extends past this lot and on into the service yard. The location, topography and general conditions of this property were well suited to all the requirements of the contemplated design of the service building, and the final design as developed to fit these conditions came as near to meeting the ideal as could have been desired.

Utilities service building, Omaha

Service Building—The building has a frontage of 172 ft. on Twentieth St. and a depth of 139 ft., extending to the west building line of Nineteenth St. The main automobile entrances are on Twentieth St.; the two entrances to the auto-repair shop, and through it to the auto-storage space or garage, are near the north end of the building; and the main automobile entrances, leading directly to the garage, are near the southerly end. Two ramps lead from these latter entrances, one with slight downgrade to the main floor, and the other running up to a mezzanine floor extending the full length of the rear half of the building. The main floor is reserved for storing the heavy trucks and the mezzanine for lighter equipment.

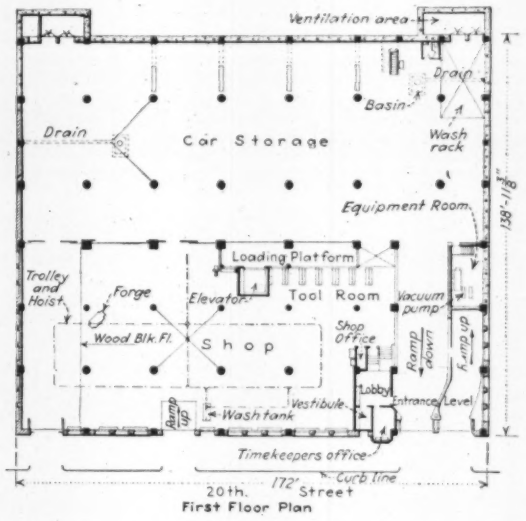
The level of Nineteenth St., on which the rear of the building faces, is 18 ft. higher than the street level at the front of the building. Since the railroad track was located on this higher level, the second floor was laid at an elevation equal to car platform height above the track. A loading platform was provided along the rear of the building at this same level. By this arrangement all material arriving by rail can be wheeled in on the second floor, which is the main storeroom floor. As this section of the street has been paved level with the top of the rails, material coming in or going out by trucks can be handled from this platform with equal facility.

The service building is three stories in height in front, the first story having a clear height of 21 ft., except where the mezzanine floor intervenes. The second and third floors furnish space for storage and other purposes, more fully described hereafter. Provision was made in designing the building to add another story, without interfering with operations, at any time in the future when the growth of the district's business warrants it.

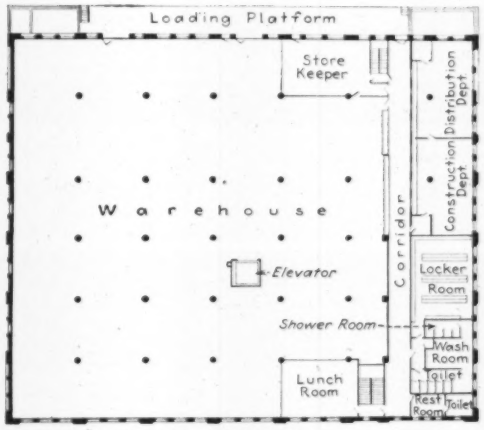
Garage—As noted, the first and mezzanine floors are devoted exclusively to motor-operated equipment. A fully equipped auto-repair shop 65x122 ft. handles all repair work on cars, trucks and other special equipment. Servicing of cars with gasoline and oil is done at night, the gasoline pumps, air pumps, air lifts, etc., all being located within the building. An underground tank of 10,500-gal. capacity receives gasoline directly from tank cars. Washing and checking of cars also is done at night under a regular schedule. Exclusive of the repair shop space the first floor can accommodate 36 of the larger trucks, and 42 small trucks and cars can be stored on the mezzanine floor.

Careful records are kept of the operation of all cars, including gas and oil used, mileage, cost of repairs, etc.

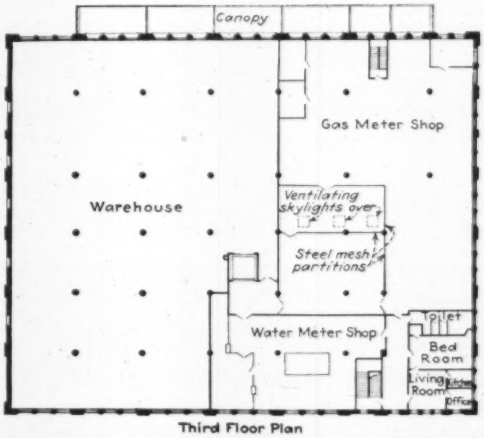
The clerk responsible for these records has his office near the main automobile entrance, where he can check cars entering or departing and also operate the automatic doors. Drivers are required to check the time of leaving and returning by means of a time clock near the entrance. The foreman in charge of the garage and auto repair shop is also custodian of the building.



First Floor Plan



Second Floor Plan



Third Floor Plan

Floor plans of utilities service building, Omaha

Mezzanine floor, not shown, covers first-floor car-storage space.

An automatic freight elevator in the center of the building provides convenient means for the transportation of materials between floors, and adjacent to the elevator there are interior loading docks on both first and mezzanine floors, where lighter materials required for maintenance and repair, particularly meters, can be loaded on the service trucks without resorting to the outside loading platform.

Storeroom—Approximately 60 per cent of the floor space of the second and third stories is allotted for storeroom purposes, as all materials used for services, repairs, maintenance and construction, except cast-iron pipe and specials and large gate valves, are stored here under charge of the storekeeper. In considering the space allotted to the storekeeper it should be borne in mind that gas stoves, gas furnaces, hot-water heaters and sundry other gas appliances merchandised by the gas department are kept in storage, and that these occupy considerably more space than do the materials required exclusively for water supply. All materials, including those stored in the service yard, must be obtained through requisitions on the storekeeper. The office of the storekeeper is located on the second floor next to the entrance from the main loading platform.

Service Offices—The offices of the general foremen of the water and gas departments and the service foreman are located at the southerly end of the second floor. Offices of the water and gas foremen are consolidated, with one corps of clerks performing the office duties for both departments.

All applications for services, meters, extension of mains, etc., are made at the main office of the District and are transmitted from there, through proper channels to the service building. The service men of both water and gas departments receive their orders for work from the office of the service foreman. They are dispatched each morning with definite orders for a prearranged program but keep in periodic communication by phone with the office to take care of any additional calls.

Main Extensions—The general foremen have charge of all main extensions, under the supervision of the construction engineer. The general procedure in prosecuting the work of laying mains is as follows: Blueprints showing work approved for construction are furnished by the main office to the general foreman, and the engineer in this office is instructed to lay out the work. The general foreman designates one of the gang foremen to proceed with the work and dispatches the necessary material, trenching machine and other field equipment to carry out the job. After the main is laid the field engineer measures the line, notes all important items pertaining thereto, and these data are recorded on a sketch attached to his report. All material and supplies used on the job are checked out from the storeroom, and after completion all tickets covering this work are turned in to the construction clerk at the main office, where a complete report is made showing all unit costs. As the cost of all mains is assessed against abutting property, it is essential that these reports be prepared with great accuracy. The general foremen report to the office in the service building at least three times each day, either in person or by phone.

Emergencies—The service building is connected with the fire alarm system of the city, and all fire alarms are received there. In the event a second alarm is sounded the general foreman of the water department reports at the scene of the fire and, if necessary, calls for such additional help as may be required to maintain adequate water pressure. The fire alarms are received also at the pumping stations.

For the purpose of dealing with emergency calls at all times 24-hour service is maintained at the service building. Out of regular hours a night man is on duty to communicate immediately with the general foreman and the emergency crew, should a break be reported or a second fire alarm sounded. For the better execution of such work as demands immediate attention, a small apartment has been provided on the third floor of the service building, where a night crew, consisting of foreman, truck driver and two laborers, is constantly on duty. Sleeping quarters and facilities for preparing light meals are included in the accommodations furnished for the night crew. A special truck, provided with necessary tools and other equipment, is maintained in readiness to meet all calls. Direct telephone connection can be had with the service building at all hours through the main-office exchange, and in addition two independent trunk lines are provided for direct communication to the service building.

The water meter shop is located on the third floor of the building. It is equipped with the usual appliances required for testing and repairing water meters. All meters are tested before being placed in service.

The service building is heated with low-pressure exhaust steam, piped from the gas-works across the street.

Service Yard—The service yard, which may be considered as an auxiliary to the service building, lies immediately to the south, the same railroad siding that passes along the rear of the service building extending into this yard. It has an area of 65,000 sq.ft., providing ample room for the storage of cast-iron pipe and special castings. Two old buildings on the lot, one 60x125 ft. and the other 47x85 ft., afford space for covered storage of gate valves and all field equipment, such as trenching machines, backfillers, concrete mixers and air-compressors.

Personnel and Equipment—Because of the combination of water and gas departments, with much of the equipment being used jointly and many of the employees devoting time and service to both, it is difficult to compare these conditions with those existing in a department that manages only a water supply. In consequence, only the personnel list and list of field equipment for the combined service can be given.

PERSONNEL

	Men
Water and gas distribution office	8
Water and gas meter shops	20
Water and gas construction office	7
Storeroom—general and office	12
Garage—shop and office	20
Total	67

FIELD EQUIPMENT

Trenching machines	2
Backfillers	4
Air compressors	2
Dragline and crane	1
Tractor	1
Concrete mixers	2

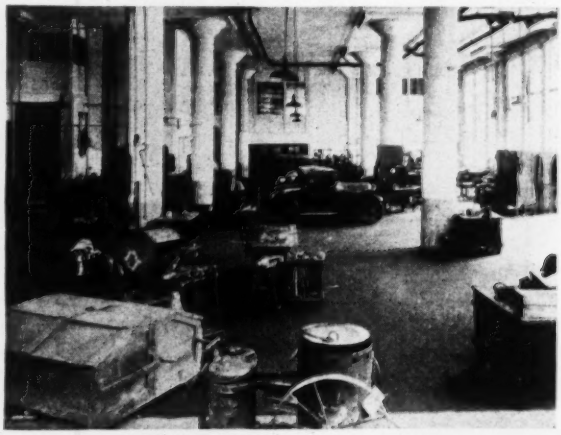
One of the backfillers is equipped with a light crane and is used for unloading pipe from cars.

MOTOR VEHICLES

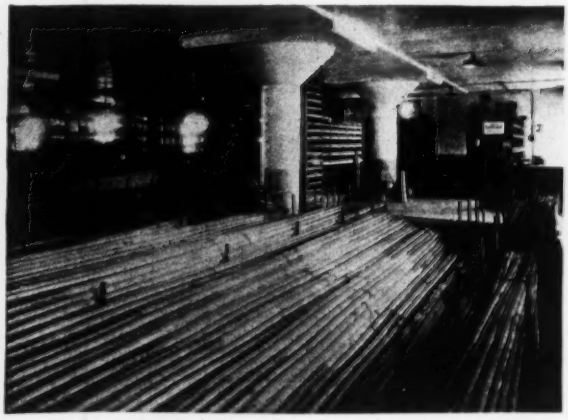
5-ton trucks	2
2-ton trucks	5
1½-ton trucks	4
1-ton trucks	5
Light trucks	46
Sedan	1
Coupés	2
Roadsters	5
Total	70

In addition to the motor vehicles listed for the service department, the district maintains a sedan that is kept at the main office for the use of the general manager.

Office Building—Coincident with the construction of the service building, a new main office building also was erected at Eighteenth and Harney Sts., one block from the city hall. The entrance to the building on Harney St. opens on a large central lobby, on one side of which are the cashiers' cages, where all bills are paid, and the information department, where applications for services and meters are received, adjustments made and general information given. On the opposite side and at the rear are the purchasing and promotion departments. The front windows and part of the central lobby are utilized for displaying various gas-burning appliances. On the second floor are the board room, office of the general manager and offices and drafting room for the engineering department. The third floor is occupied entirely by the accounting department; and the fourth floor, used occasionally for receptions and meetings of the Utilities Employees' Association, is held in reserve for future extension.



A complete repair shop for automobiles and trucks is provided



Storeroom stocks pipe, fittings, valves and supplies of all kinds for water and gas installations

Two additional stories can be added without interfering with other parts of the building when an increase in the growth of the District's activities necessitates further expansion.

Dependability of Water Service Requires Preparedness for Emergencies

A summary of the organizations set up and the methods employed by seven representative cities to insure continuity of distribution service

WITH DEPENDABILITY of service of fundamental importance in the operation of a water-works, superintendents must be prepared at all times to make repairs to a distribution system with the utmost speed. An organization must be set up ahead of time that will work quickly and smoothly from the first notification of a break in a pipe line to its final repair and resumption of service. An emergency crew available at all hours of the day or night, provided with all the necessary equipment and materials to expedite the work of repair, characterize the measures taken by well-operated water-works systems to assure the consumers that interruptions to service will be infrequent and of short duration.

In the following group of articles the organizations set up and methods employed for emergency work by seven cities are described. They vary in size from New York, with a population of 7,000,000, to Peterborough, Ont., with 23,000. The information contained in the articles was made available by William W. Brush (New York), Loran D. Gayton (Chicago), Frank H. Stephenson (Detroit), William A. Foley (St. Louis), J. H. Kennon (Pittsburgh), Ralph Earl (New Orleans), and R. L. Dobbin (Peterborough, Ont.).

New York City

In the operation of the New York City water-supply system the basic principle set up as a guide is: "The design and operation of the system is to be such that there will be available at all times safe and reasonably effective service irrespective of the failure of any part." Although the principle has not yet been applied entirely, the system is gradually approaching this ideal.

Structures for the collection and transportation of water are generally of a type that can be expected to give uninterrupted service, but even here provision is made for storage reservoirs and aqueduct capacities in excess of normal requirements to provide against unforeseen contingencies. Thus, in the Catskill system the Kensico reservoir, holding some 30,000 million gallons of water, was built so that if anything should happen to the 75 miles of aqueduct between the storage reservoirs in the Catskill mountains and the Kensico reservoir, its contents could take care of the consumers until repairs were effected. While there is at present only one aqueduct from the Kensico reservoir to the city, an additional aqueduct of sufficient capacity to supply, in an emergency, practically the entire needs of the city has been authorized by the board of estimate and apportionment. This aqueduct is to connect to a delivery tunnel that, through a loop system, assures continuity of supply to four of the five boroughs. The fifth borough, Staten Island, is safeguarded by two independent pipe lines and siphons under the Narrows and by the development of local water supplies, so that either siphon may be out of service without impairing the full supply.

Pumping stations, where continuity of service is essential, are provided with reserve equipment, and there is always on duty a force sufficient to provide reasonably against any emergency. In one of the newest units (a small station serving the higher part of Staten Island) electric power is used, with a gasoline engine driving a pump of sufficient capacity to give service in case of failure of the electric power.

In the distribution system the design of pipe lines for a number of years has been on the basis that any one line may be shut down without seriously affecting the delivery of water to any part of the city. For this distribution system the more important items in the organization to meet emergencies are as follows:

1. For each of the larger boroughs certain members of the engineering force are designated to be within reach of the telephone from the time they reach home after the office closes until the office opens again.

2. Each borough has a truck equipped with gate-operating devices (with two for the borough of Manhattan) and a crew of four to five men on duty throughout the night hours and on Sundays and holidays to shut down a broken water main or perform other emergency work. If these crews are assigned to any work that takes them away from their headquarters, one of the men remains in communication with the headquarters by telephone.

3. All trunk mains (20 in. in diameter or larger) are indicated on "shut-off maps," which also show all the valves necessary to be operated to complete the shut-down of the main. The location of each valve is referenced so that it can be found if the ground is covered with ice or snow.

4. The larger valves in the distribution system are regularly operated and lubricated by a special force, so that they may be quickly closed in case of emergency.

In the sterilization of the water all chlorine installations are duplicated, so that a reserve machine can be placed in service immediately if trouble is experienced in operating the regular machine. In addition, all surface waters are chlorinated at two separate plants, so that if a chlorinating plant should fail to operate effectively for a few minutes, it is virtually certain that the water will be treated effectively at the second plant.

Chicago

Improvements in the design of pumping equipment and pipe, together with the elimination of waterhammer and electrolysis, have brought about a high degree of reliability in the 3,600 miles of pipe forming the distribution system of Chicago. Nevertheless, breaks will occur; and in the case of large pipe they may cause tremendous damage. It is therefore necessary to be prepared at all times to handle such emergencies upon short notice.

Chicago extends 20 miles north and south along Lake Michigan and 10 miles west from the lake. For the purpose of handling breaks in the water-supply system

the city is divided into three districts—north, central and south—each comprising approximately one-third of the area of the city. The pipe work in each district is in charge of a district superintendent, a foreman and an assistant foreman, with all the personnel and equipment necessary.

In both the north and south districts, which are the less densely populated sections of the city, there is held in readiness at all times an emergency truck and driver. This truck carries all the necessary apparatus for opening or closing valves or doing other emergency work. In the central district, which is the thickly settled business part of the city, there is kept in readiness an emergency truck with a complete crew, consisting of a truck driver, a calker and four laborers. The crew ordinarily takes care of any breaks in the central district but may be called into either the north or south district.

In the office of the water-pipe extension division, in the city hall, a complaint clerk is on duty at all times. As a rule he will receive four or five calls from different sources within 15 min. after a break occurs. If the break is in either the north or the south districts, he notifies the district superintendent, the foreman and assistant foreman in that district, as well as the driver of the emergency truck. The driver proceeds immediately to the location of the break; and if he cannot handle it alone, he calls the members of his crew, whose telephone numbers he always has at hand. If the break is of an unusual nature, he calls the emergency crew from the central district. The section in which the break is located is isolated by closing the necessary valves, and the repair crews are at once put to work. If the break occurs in the central district, where a complee emergency crew is ready at all times, that crew proceeds to the break and closes down the section.

The men are all specially trained for this work. They not only have maps showing the exact location of every valve in the system, but they also have personal knowledge from experience covering a number of years. The work is so well handled that for several years there has not been a break resulting in serious damage. To hold a complete emergency crew in readiness not only in the central district but also in the north and the south districts would increase the cost of maintenance. The present method has been in use for the past five years and in general has been satisfactory.

Detroit

Due to the topography of the territory supplied, continuous pumping is necessary for the Detroit water-supply system. With such an arrangement, if the pumps are stopped, the supply ceases. The present Detroit system, with pumping equipment driven by steam from its own boiler plant or by electric power from two sources of supply, is well insured against failure of the pumps to operate. Its principal emergencies arise from sudden failure of one of the large mains supplying the distribution system. There is 275 miles of water mains 24 in. or more in diameter. When one of these breaks, the effect is felt immediately at the pumping station, and it is almost always necessary to stop pumping until the break can be isolated by closing the necessary valves.

For operating economy and to minimize inconvenience to consumers the city distribution system is divided into three major zones, with a boosted zone supplied from one of the major zones. These zones are physically connected with each other but are kept separate by closed and sealed valves. A break in one zone has no effect on the others. When a break occurs, it becomes necessary to close the valves that will isolate the broken main in order that pumping may be resumed to the affected territory. For making shut-offs promptly the department maintains four special trucks at the storage yards, where employees are available 24 hours a day to answer calls. Two trucks capable of traveling at fire department speed answer each call. Each truck is equipped with tools, special equipment, a gate-closing device operated by the truck motor and a section map

Detroit maintains four emergency trucks, each equipped with a gate-closing device

Special trailer for rushing tools and equipment to scene of emergency repair work in Detroit

of the distribution system, showing water mains and valves. Each map covers one square mile of territory drawn to a scale of 1 in. equals 300 ft. The valves are usually set on the projected property line of the street in which the main lies. Since all valves are set in gate wells having large cast-iron covers, they are easily located. In addition, a gate book covering the larger mains is carried on each truck and by certain officials. This book, with an index, is made up of loose-leaf sheets 8½ in. square, showing on a scale of 1 in. to 30 ft. all important data relating to mains 24 in. in diameter and larger. At the edges of the sheet are numbers indicating the sheets showing adjacent essential information in each direction. Because of the large scale these gate books are particularly useful at night.

With the break isolated and ready for repairs, the repair gang can go to work at once. At the central storage yard there is kept in readiness a trailer that can be towed to the scene by any auto vehicle and that contains tools for almost any kind of repair work. Upon notification of a serious break in a water main the super-

intendent of power machinery goes to his headquarters and is prepared to send out pumps, air compressors and other equipment as called for. For night work the department has a gasoline-driven mobile lighting plant, which can be towed to the scene and will furnish ample light to carry on the work. The department maintains unlisted telephone lines for use of officials in emergencies, to assure prompt communication with the pumping stations and other important points.

Pittsburgh

To facilitate the execution of pipe-line construction, maintenance and emergency repair work, the distribution system of Pittsburgh is divided into four self-contained districts, in each of which there is a centrally located material yard serving as a base of operations and providing storage facilities for pipe-line materials and automotive equipment. All sizes of cast-iron pipe, fittings, valves, fire hydrants and other elements of the distribution system are kept in stock. Of particular value in emergency repair work are the pipe-line maps kept at each yard, showing the lines, valves and special features of the system in that particular district. Other district equipment includes portable gasoline-driven centrifugal pump, a number of hand pumps, acetylene lamps and a portable gasoline-driven electric-generator plant with two 500-watt floodlights. The crews of the various yards are subject to call at any hour of the day or night for emergency service. In addition to the district yards the bureau maintains at its repair shop for automobile trucks an air compressor, mounted on a light truck, ready for emergency work.

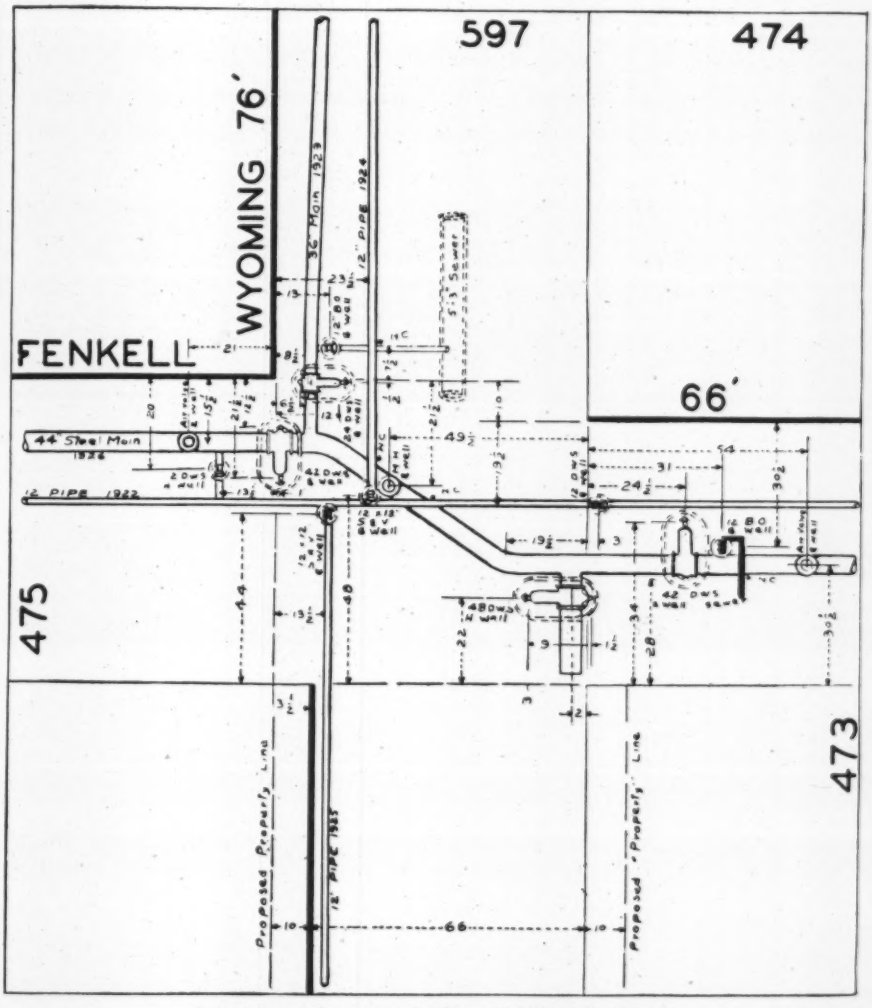
For maintenance and repair of fire hydrants the city is divided into six districts, each with two men. All this work is in charge of a pipe-line foreman, who reports to the chief fire-hydrant inspector. These men are subject to call at all times. The office of the chief service inspector is open and provided with telephone switchboard service day and night, so that notification of a pipe-line break or other emergency may be relayed at once to the proper official.

For repairs to steel pipe lines, work which the bureau is not equipped to handle, an emergency order is issued immediately to a local company.

New Orleans

Selection of the personnel is considered the most important item in preparing to handle emergencies. The foreman must be available by telephone at any time, willing to leave his dinner or his bed to answer an emergency call, and able to command the loyalty and co-operation of his subordinates. Naturally, he must also be resourceful and possessed of the necessary information to carry through an emergency job. The crew must be of adequate size and of the proper degree of intelligence. They must be willing to answer calls promptly and to work hard and continuously until they are relieved. At New Orleans laborers have worked for 72 hours continuously in an emergency.

In that city special castings are carried in stock at the storage yard for the replacement of any portion of the distribution system. Light automobile trucks equipped with valve-operating devices are used regularly for maintenance of gate valves and are available for closing valves when a break occurs in a pipe line. There is also mobile pumping equipment for dewatering cuts in the streets. Complete maps of the distribution system give the location of valves and pipe lines, but they are not sufficiently compact, so that the most useful information concerning valve locations is in the memory of the man in charge. A record is kept of the number of turns required to close each valve and of its position after its



Sample page from gate book carried by each Detroit emergency repair truck

Failure of a 60-in. steel water main in Pittsburgh

last operation, so that the status of each valve may be known.

At New Orleans a situation often requiring emergency treatment results from oil smears on the water surface at the intake, and temporary relief has been obtained by erecting cloth baffles at the water surface. Later, wooden baffles were set up and water jets installed to wash the oil away from the intake and into the main current of the stream.

St. Louis

To expedite the repair of breaks in the distribution system so that service can be resumed promptly, the St. Louis water department maintains an emergency repair organization with headquarters at the central pipe yard. In addition to the men on duy during regular working hours, there are two shifts on duty during the night. Telephone service is available 24 hours a day, and upon receipt of information of a break in a pipe line the operator notifies the night superintendent who is on duty.

The emergency truck, dispatched to the scene of the break, carries all the necessary tools for making a repair. Shut-off wrenches, lead keys, cutting tools, picks, shovels, oxy-acetylene burners, jointing materials, valve nuts, sleeve spacers, pumps, a furnace and other equipment are all in their proper places. In addition, a lighting plant of 600-watt capacity, with four 150-watt extensions, is an integral part of the truck and has proved of great value in night work. The department has also a portable plant of 1,500-watt capacity that can be towed to the scene should more lighting equipment be necessary. Raincoats, oilskins, boots and hats are carried on the truck to enable the men to work more conveniently during bad weather. There are also book maps, properly indexed, which show the locations of water mains, valves and hydrants.

Minor breaks on small mains can be repaired by the emergency crew without assistance. In the event of a break on a large main, where it is necessary to handle large pipes or castings or to break through improved

A break in a 30-in. water main and its effects

street surfaces, the operators of construction machinery are summoned. Such equipment as cranes, trenching machines or air-compressors can be sent to the scene on a few minutes' notice. No pipes or special castings are carried on the emergency truck. The foreman usually surveys the situation when he arrives at the scene and then sends the truck to the storage yard for the necessary material while the valves are being closed to isolate the section containing the break. If necessary, he orders another truck from the yard to bring the materials.

To be prepared for breaks on large mains the department keeps at the yard sections of the larger pipe cut to convenient lengths for repair. It is only necessary to send the repair lengths, sleeve and spacer to the job, and installation can be started immediately. Where the repair work is of major importance workmen are kept on duty until the job is completed. The emergency crews in St. Louis seldom find it necessary to call the engineering department. In 1930 six major breaks occurred during one evening, and the emergency crews on duty handled the work without assistance.

Peterborough, Ont.

In large water departments it is quite economical to have fully equipped trucks and crews ready at an instant's notice, day and night, every day in the year to take care of emergencies. In the smaller cities and towns, however, such a procedure would be too costly, and each organization must do the best it can. In connection with the water-works department of Peterborough, Ont., a city of 23,000, the following procedure is in force:

A small truck is equipped with all the necessary keys for operating gate valves and curb cocks, picks, shovels and other small tools, a detector for locating service boxes and a large portable electric lamp. In the truck there is a book containing individual sketches giving measurements for locating all the valves in the system; also maps on a small scale showing the mains and valves. During the day this truck is at headquarters and is used for service calls and other work but is always within reach of the telephone. After working hours the truck is taken home by the general foreman and kept at his residence, where he can be reached by telephone. The garage where it is stored at night is supplied by the department and is electrically heated in the winter. If the foreman is not at home, another employee who lives close at hand is available by telephone.

In connection with the electric department, which is under the supervision of the same commission, a man is on duty from 6 p.m. to 10 p.m. with a similar truck. He takes care of electrical troubles and is also available for water-works troubles if needed. The gas department is also administered by the commission, and in case of emergency all the equipment of the three departments can be called on. This feature has been of great value in several cases.

As the water-works foreman is paid only for the extra time in taking care of emergencies after hours, the total cost is not high, and the arrangement provides a very economical and efficient service. A complete stock of split sleeves and other specials is kept on hand, and also some valve parts, so that repairs can be made at once. In the case of large fires it is the duty of one of the firemen to notify the water-works foreman, or in his absence some other official, and the truck is sent to the scene of the fire to take care of the hydrants and to see that the fire department gets all the water it requires.

Electric Eye Guards Water Supply of Denver

By D. D. GROSS

Chief Engineer, Board of Water Commissioners, City and County of Denver, Colo.

MOST of Denver's water supply is diverted from the South Platte River at an intake in South Platte Canyon, 23 miles from the city. Generally, the water of this mountain stream has a relatively low turbidity, but during the spring and summer months, when the river is high because of melting snows or heavy rains, trouble is frequently experienced from a sudden rise in turbidity.

The area of the watershed is nearly 2,700 square miles. A heavy storm on one part of the watershed may produce a water having turbidity characteristics materially different from that resulting from a storm elsewhere on the same watershed. This difference, of course, is due to soil characteristics. These variations bring with them additional problems in the handling of the water. It is necessary for the operator at the intake to keep a vigilant

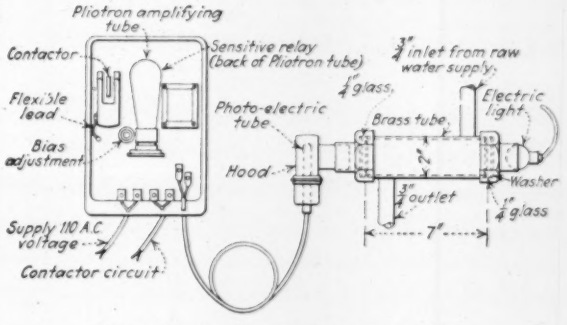


Photo-electric relay for detecting turbidity

watch, day and night, on the turbidity of the water, so as to give warning of any necessary change in handling or treatment. Sometimes it is necessary to eliminate the flow of water from a conduit line entirely until the condition of excessive turbidity has passed.

Recently George J. Turee, chief chemist and bacteriologist, has conducted laboratory experiments with the photo-electric relay unit, frequently referred to as the "electric eye," with the idea of applying this new device as a means of detecting the rising or falling turbidity and giving the operators warning. These tests conclusively determined the utility of this equipment for the service outlined. The photo-electric tube, while of comparatively recent development, has already obtained a wide and varied use in industry. We do not know of its ever having been applied for service in water-works and believe that our installation is one of the earliest, if not the first, application of this device for water-works service.

The photo-electric relay is a light-sensitive device for controlling an electric circuit in response to a substantial increase or decrease in the amount of light falling on it. The principles of the equipment are fully described in current electric literature. In order to utilize the relay in connection with turbid water we have fitted a piece of 2-in. brass pipe 7 in. long with plate-glass disks at each end. Nipples provide a means for introducing and discharging the water. In operation, a continuous stream will flow through this pipe. The photo-electric tube will

be placed in front of the glass at one end and a small electric light at the other. When water of predetermined turbidity passes through the pipe the resulting shadow on the photo-electric tube will react through the relays to sound a gong and warn the operator. Having detected the influx of muddy water, the device will then be set to sound a warning when the stream clears to normal condition by throwing a switch that will reverse the normal operation. Whereas previously, the relay reacted to a shadow produced by muddy water, it will then react to an increase in light due to the clearing of the water and will again sound a gong when the water has reached a stage of normal turbidity.

The photo-electric tube is more accurate in its determinations than the human eye and will be of material assistance to the operator in giving immediate warning of a rise or fall in turbidity. Normally water is drawn to large reservoirs for sedimentation before treatment at the filter plants. A portion of the water, however, is taken direct to the filter plants. If a flow of excessively turbid water is permitted, a clogging of the filter beds results.

We believe this device is useful not only for the purpose outlined above for plants having conditions similar to ours but also that beneficial use can be made of this device in other features of water-works operation, especially in filter plants.

Low Water Table Forecasts Small Autumn Streamflow

ONLY excessive rainfall during the next few months will prevent streamflow conditions from becoming worse next fall than last year, due to diffusion in underground storage. Replenishment of groundwater ordinarily begins in January after vegetation becomes dormant, but no improvement in supply was indicated this year until the latter part of March.

While this observation was made at a well of the U. S. Geological Survey near Washington and represents in detail only the conditions in that vicinity, it has general significance for the entire region that has been afflicted with subnormal precipitation. Little further improvement in groundwater conditions is expected from now on because most of the rainfall, except that which escapes as surface water, is absorbed by vegetation.

The automatic recorder on the observation well showed that replenishment of the groundwater supply began March 28 and that the water level in the well had risen 6.72 in. by April 18 and only 8.28 by May 16, the rise being very slow in the latter period. Prior to March 28 no replenishment had been recorded for nearly a year, and the water level on that date stood about 3 ft. lower than on the corresponding date in the past two years. The total precipitation responsible for the rise in the level amounted to 12.40 in. during the period from October to April inclusive, as compared with 20.40 in. during the corresponding period of 1929-30. Although the precipitation since April 18 has been moderately heavy, the demands of vegetation have been so great that very little moisture has dropped below the root zone.

In 1929 the water level in the well began to rise in January and continued until May, when the total rise recorded was more than 2 ft. The level then dropped until the middle of January, 1930, when it stood 1 ft. lower than at its low stage in 1929. From the middle of January to the end of April last year the water rose a little more than 2 ft., but from early in May until late in March this year it declined continuously, although at a much slower rate during the past winter than in the preceding summer and autumn. During this period the total decline was about 3 ft.

The failure of the water level to begin to rise as early during the past winter as in the two preceding winters was due not only to last year's drought but to subnormal precipitation during the winter. Although the soil had received by the end of March nearly all the moisture that could be stored in it and represented a fairly satisfactory supply for the spring needs of pastures, trees and crops, it is obvious, the Geological Survey reports, that there is little prospect of obtaining substantial replenishment of underground storage until next winter.

Failure of replenishment early this spring will in all probability result in depressing the water table to new low stages next summer and autumn, which, in turn, will cause the failure of additional shallow wells and the further dwindling of the flow of springs and streams. Recent heavy rains produced the rise of 6 in. in the observation well in the period beginning March 28, but this constitutes only a small part of the needed recovery.

In other localities in the vicinity of Washington some replenishment of the groundwater supply occurred prior to March 28, but for the section as a whole the replenishment has been far below normal and the water-supply situation has been unfavorable. Measurements made by the Pennsylvania Geological Survey in two shallow wells in the northern part of the state indicates that groundwater replenishment began earlier there than in the vicinity of the Washington well.

As a rule, the deeper drilled wells are not seriously affected by droughts because they extend to considerable depths below the water table and draw their supplies from underground reservoirs of great holdover capacity. The shallow dug wells, however, extend only slightly below the normal position of the water table and hence many of them go dry or nearly dry when the water table descends to an exceptionally low stage. Springs receive only the overflow of the great underground reservoirs and hence are very sensitive to fluctuations in the water table caused by seasonal differences in rainfall. The streams depend on the springs for their flow except in times of storm runoff, and they are also sensitive, therefore, to fluctuations in the water table.

Damage to Fish From Tarred Roads

In a closely settled country such as England, where highways and watercourses are in close proximity, definite damage to fish life has been traced to the leachings from tarred roads. Exhaustive government researches have been made of the intensity, extent and toxicity of various tar preparations by a joint committee of the British ministry of transport and ministry of agriculture and fisheries. In an abstract of the report in *Municipal Engineering* it is stated that the toxicity of the samples tested—road samples as well as those from specially tarred surfaces—was not of a particularly high order. Saturated extracts of Road Board tar are on the whole more toxic than those of synthetic tar, complete recovery of the fish after exposure to the latter being sometimes observed. Road Board tar contains relatively much tar acid with little tar base. An attempt to produce a non-toxic tar fit for use as a dressing for roads was not successful.

NEWS OF THE WEEK

U. S. Court Rules Floodway Lands Must Be Paid For

A DECISION by the Fifth United States Circuit Court of Appeals on May 15 upholds the ruling of the lower court that property owners in floodway areas must be reimbursed for their lands before flood-control levees are constructed or contracted for. R. Foster Kincaid, Sr., owner of a 160-acre tract in the Boeuf River basin, brought suit against the secretary of war and other government officials and asked for an injunction restraining them from building the guide levees of the Mississippi floodway until provision is made for compensating owners of the land in the floodway. The district court granted the injunction (see abstract of decision in the issue of Jan. 9, 1930, p. 60), and the government appealed.

In the original suit Kincaid claimed that his land is valued at $9,000 but that action of the government in planning for construction of the levees has already thrown a cloud of title across his property, and that he is able neither to secure loans on the property nor to dispose of it. The lower court ruled that it is not sufficient for the government to plan to pay or consider paying damages or securing flowage rights after actual flood damage has occurred.

The circuit court now says: "We conclude that the appellee was entitled to the relief granted by that decree. There are no reversible errors and the case is affirmed."

The decision will have no effect on the construction of the Bonnet Carré spillway, where formal condemnation procedure was conducted for acquisition of the necessary land. It will, however, have a vital effect on the government's plans for floodways in the Boeuf, Tensas and Atchafalya basins, and will mean a great increase in cost of the flood-control program.

Lincoln, Neb., to Add to Its Water Supply

Plans are nearing completion for a 30-mile pipe line to bring water from the Platte River to supplement the present well supply of Lincoln, Neb. Since 1905 the water consumption of the city has risen from 1,280,000 gal. daily to 7,800,000, which has caused a drop of 2 ft. in the water table. Last year, because of the drought, the drop was 5 ft. The wells that supply the city tap a fresh water stratum that is underlain with salt water and a heavy drawdown on a well results in its turning salt. At present 26 of the 50 wells in the Lincoln area no longer produce potable water. By tapping the Platte River a supply of 15,000,000 gal. daily is expected. On April 7 an issue of $2,400,000 bonds was voted. D. L. Erickson, city engineer, is in charge of the preparation of plans for the project.

Contracts Awarded for Sixth St. Viaduct, Los Angeles

Three contracts covering construction of the Sixth St. viaduct in Los Angeles, Calif., were awarded May 15 by the city's board of public works on bids totaling $1,420,223. The general contract, which covers all work except the fabrication and erection of the structural steel, was awarded to J. F. Knapp on a bid of $1,272,525. The contract for steel fabrication went to the Virginia Bridge & Iron Co. on a bid of $112,330, and the contract for erection of steel was awarded Allan Brothers, Inc., for $35,368.

The viaduct will connect Whittier Blvd. at Boyle Ave. with Sixth St. at Mateo St. Its cost will be shared by the city, the county and the Union Pacific and Santa Fe railways, the two governments each paying 37½ per cent and each railway paying 12½ per cent.

A contract was awarded last year for river piers, substructure work and a subway under the Santa Fe tracks for $181,883, bringing the total cost of the viaduct to $1,602,106. Work on the first contract has been completed.

Vancouver to Ask Bids on a 3,000-Ft. Pressure Tunnel

Bids for the construction of a pressure tunnel 3,000 ft. long under the First Narrows of Vancouver harbor will probably be called before June by the Greater Vancouver Water District. The work will consist of sinking two 400-ft. vertical shafts and excavating and lining the 7-ft. rock tunnel. Depth to rock at the north shaft will require pneumatic operations. The project also includes 5,000 ft. of 66- to 70-in. pipe line across Stanley Park. The work is an extension to the district's water-supply system.

Seattle Denied Franchise to Extend Its Water System

The application of the city of Seattle, Wash., for a franchise to extend its city water system beyond the north city limits in competition with the Mountain Lakes Water Co., has been denied by the King County commissioners. The water company, backed by Ulen & Co., of New York, plans a construction program, ultimately costing $5,000,000, to provide water facilities for the district between Seattle and Everett.

Boulder Dam Act Is Valid, Supreme Court Holds in Arizona Suit

ARIZONA'S suit attacking the Boulder Dam act of Dec. 21, 1928, as unconstitutional and charging that Secretary of the Interior Wilbur is invading the rights of Arizona in proceeding to construct the dam was dismissed by the U. S. Supreme Court in a decision handed down May 18. Justice Brandeis, who delivered the opinion, found the act to be valid and further found that neither the act nor procedure under it infringes Arizona's rights. Justice McReynolds dissented, holding that the motions to dismiss should be overruled and the defendants required to answer.

River Once Navigable

The Boulder Dam act is found constitutional and valid because the Colorado River once was navigable and "commercial disuse resulting from changed geographical conditions and a congressional failure to deal with them does not amount to an abandonment of a navigable river or prohibit future exertion of federal control." In view of this finding on navigation the court says that it has "no occasion to decide whether the authority to construct the dam and reservoir might not also have been constitutionally conferred for the specified purpose of irrigating public lands of the United States; or for the specified purpose of regulating the flow and preventing floods in this interstate river; or as a means of conserving and apportioning its waters among the states equitably entitled thereto; or for the purpose of performing international obligations." The act being valid, federal construction may proceed without approval of Arizona officials, as "the United States may perform its functions without conforming to the police regulations of a state."

On the second claim considered by the court, that construction of the dam interferes with Arizona's right to appropriate water from the river, the decision finds that there is no such interference: "As Arizona has made no such [interstate] agreement, the act leaves its legal rights unimpaired."

Dealing with the claim that Arizona is discriminated against by a provision of the act that allows diversions across federal lands, only on condition that these diversions be subject to the Colorado River Compact, the decision says: "Arizona has, of course, no legal right to use, in aid of appropriation, any land of the United States, and it cannot complain of the provision conditioning the use of such public land."

The decision concludes: "As we hold

that the grant of authority to construct the dam and reservoir is a valid exercise of congressional power, that the Boulder Canyon project act does not purport to abridge the right of Arizona to make, or permit, additional appropriations of water flowing within the state or on its boundaries, and that there is now no threat by Wilbur, or any of the defendant states, to do any act which will interfere with the enjoyment of any present or future appropriation, we have no occasion to consider other questions which have been argued. The bill is dismissed without prejudice to an application for relief in case the stored water is used in such a way as to interfere with the enjoyment by Arizona, or those claiming under it, of any rights already perfected or with the right of Arizona to make additional legal appropriations and to enjoy the same."

Plans Made to Augment Salt Lake City Water Supply

A bond election to raise $2,000,000 to be expended in increasing Salt Lake City's water supply has been tentatively set for July 1. In the meantime the city commission has agreed on a general plan which involves a number of projects, and in order to finance the program in a preliminary way the city contemplates issuing short term notes for $600,000, which is deemed sufficient to provide enough water for the coming summer to prevent a shortage

The two most important projects which will get under way this spring are the purchase of water rights and property from several private water companies involving water from the Little Cottonwood stream coming from Little Cottonwood Canyon, southeast of the city; and the purchase of artesian wells and springs in the section of territory lying southeast of the city. The first of these projects will also involve the construction of conduit to deliver the water into the present Big Cottonwood conduit. The second project will include the construction of a conduit from the artesian basin to the city mains.

Additional projects will include the construction of three equalizing reservoirs—one at Sunnyside site, one at the head of the 27th South St. line and the third at the mouth of Parley's Canyon; the purchase and installation of a 10-sec.-ft. pump at 60th South St.; and the construction of a 1,000,000-gal. reservoir and a pipe line to conserve Spring Creek water.

The property and water rights which the city will acquire from private water companies on the Little Cottonwood project include a number of filings on miscellaneous streams.

It is expected that the Little Cottonwood and the artesian well projects will be in operation in ample time this spring and summer to take care of needs which will develop as the season progresses.

An increase of 33⅓ per cent in water rates is also contemplated, and an ordinance to that effect will be prepared.

Hardy Dam on Muskegon River in Michigan Completed

The Hardy earthfill dam, built on the glacial drift of the Muskegon River valley at the Oxbow, near Newago, Mich., has been completed. It was built by Allied Engineers, Inc., for the Consumers Power Co. as another link in the company's hydro-electric development of the Muskegon River. The dam contains 1,385,000 cu.yd. of fill, has a crest length of 2,800 ft. and rises a maximum of 117 ft. above the low point in the riverbed. Steel sheeting 60 ft. long was driven through gravel overlying a clay bed to provide a cutoff. A thin concrete corewall runs the entire length of the fill from the top of the sheeting to the top of embankment. A feature of construction was the sluicing of materials from the outside edge of the embankment toward the center to build up a core of fine material next to the concrete wall. The generating equipment consists of three units of 14,800 hp. each. George F. Stecker, construction manager, and G. C. Willson, construction superintendent, were in charge of construction for Allied Engineers, Inc.

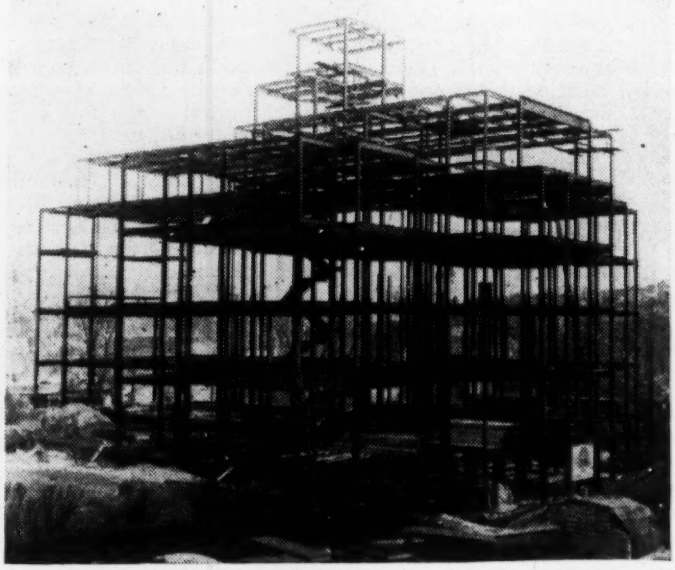
Substitution of Light Sections Brings Order to Raze Six-Story Steel Building Frame

FAILURE to follow plans and specifications in the fabrication and erection of the six-story steel frame of the new City Health Center building in Yonkers, N. Y., has resulted in the common council of the city ordering the steel contractor to reconstruct the building. The order followed disclosure that 168 beams and columns were lighter than specified and that liberties had been taken by the steel contractor in revising the framing plans shown on the architect's drawings.

Four stories of steel were erected before any question was raised as to its adequacy, and most of the steel in the remaining two stories was set before the order to reconstruct the building was issued. The building was designed by a private architect and inspection was numbered among his duties. Inasmuch as the construction of the building was under the supervision of a special committee appointed by the common council and consisting of the commissioner of public works, the city architect and the city engineer, inspection by the city building superintendent's department was not made.

The order to reconstruct the building as the only means of securing a job that would conform to the requirements of the contract was made by the common council following the recommendation of James N. Keenan, district engineer of the American Institute of Steel Construction, who had been called in to investigate the matter.

The controversy over the Health Center building began on April 3 when the city building superintendent announced that a check of the first-story steel (made at the request of the mayor) showed that a number of columns had been reduced in weight from that required on the plans. The discrepancy had first been discovered by the architect's engineer who had made the original plans. The steel had been designed on the basis of a 16,000-lb. unit stress (in accordance with the Yonkers building code) but apparently had been redesigned on an 18,000-lb. basis by the steel contractor. The building super-



Poor workmanship and disregard of plans resulted in an order to rebuild this new steel frame building in Yonkers, N. Y.

intendent reported, however, that some of the beams and connections would not stand analysis on an 18,000-lb. basis.

He was then ordered by the mayor to make a thorough investigation of all steel and on April 16 made an extensive report that disclosed the following: 55 of the 70 columns of the lower section, 43 of the 69 columns of the second section and 11 of the 63 columns of the third section had been reduced in weight; 28 beams in the first story, 46 beams in the second story, 33 in the third story, 48 beams in the fourth story and 4 beams in the fifth story had been reduced in weight; in several places a single beam had been used where two were shown on the plan; riveting on all the tiers was poor, rivet heads were not concentric with holes and many rivets were loose and showed signs of having been burned in heating; numerous holes had been burned to make the holes fair; connection angles were poorly fabricated; in the second tier 28 of the 69 columns had poor bearing and poor splices; shim plates were not the proper thickness and not properly fitted; shelf angles had been omitted on numerous spandrel beams; and in the fourth tier the location of a girder had been changed from one column line to another.

In his report the building superintendent recommended that in lieu of actually dismantling the building the only proper method of bringing the steelwork up to requirement was by the use of cover plates on columns and beams. He also recommended numerous replacements of members. In the final decision this recommendation was not followed because of the difficulty of reinforcing the column-to-beam connections properly. The steel contractor suggested incasing columns in stone concrete, but the building superintendent stated that he would not approve such design. The present order requires that the building be erected in accordance with the plans and specifications, which is interpreted as meaning that the steel must be almost entirely replaced.

The Yonkers Health Center building was designed by William P. Katz, architect, Yonkers, N. Y. The actual design was carried out by Matthew Hillyer, structural engineer in Mr. Katz' organization. The general contractor was John J. McMahon and the steel contractor Kues Bros., both of New York City. James W. Armstrong is superintendent of building of the city of Yonkers.

Contract Awarded for 8 Miles of 52-In. Steel Pipe

The Hackensack Water Co., of Hackensack, N. J., opened bids on May 4 for furnishing and laying about 8 miles of 52-in. pipe from the New Milford pumping station through Bergenfield and Teaneck to Englewood. The specifications called for cast-iron, reinforced-concrete, welded steel or lock-bar steel pipe, and the award was made to the T. A. Gillespie Co., of New York City, which bid on the lock-bar type. The contract involves about 6,500 tons of steel. The bids were opened in private and no figures were announced.

Southern California Edison Co. Sued in Water Rights Case

Seeking an injunction to prevent the Southern California Edison Co., Ltd., from constructing dams and reservoirs and storing water in the mountains east of the lower San Joaquin Valley, the Central California Mortgage Co. and John C. Kincanon, owners of land in San Joaquin County, Calif., have filed in Stockton, Calif., separate suits against the power company. The mortgage company is the owner of 400 acres of land, and Mr. Kincanon is the owner of 693 acres. Both plaintiffs contend that large acreages are fertilized by silt deposits and that the full flow of the river is required. In the event the injunction is denied, the Central California Mortgage Co. asks $125,000 damages and Mr. Kincanon asks $150,000 damages.

New York Must Cease Garbage Dumping in Ocean, Court Rules

UPHOLDING in every respect the findings, conclusions and recommendations of Edward K. Campbell, special master, the U. S. Supreme Court on May 18 handed down a decision declaring the State of New Jersey entitled to an injunction to restrain the city of New York from dumping garbage and other offensive matter into the Atlantic Ocean off the coast of New Jersey and thereby polluting its beaches and waters. Before the injunction shall issue, however, a reasonable time shall be granted the city in which to erect incinerators. In order to determine this period the special master is directed to take evidence and report his findings to the court.

A summary of the special master's report was published in the issue of March 26, p. 536. Briefly stated, his findings of facts included the following points: The territory chiefly affected extends from Atlantic Highlands southerly 50 miles to Beach Haven and has an assessed valuation of $139,000,000 and a permanent population of more than 160,000, which is greatly exceeded during the summer months. Vast amounts of garbage are cast on the beaches, constituting a menace to health and depreciating property values. Since 1918 New York City has been dumping garbage almost daily at points 10, 12½ and 22 miles from the New Jersey shore in large masses which float for an indefinite period, some of them being carried to the beaches and deposited thereon. The city, in 1929, had twenty incinerators, but the quantities still being dumped at sea are very large. The condition creates a public nuisance upon the property of New Jersey, and the latter is entitled to relief.

New York City's defense was based upon three points: first, that the garbage was dumped in accordance with per-

NEW YORK'S CHANGED MID-TOWN SKYLINE

At the extreme right, the Hotel New Yorker, largest on Manhattan Island; next to the left, the Empire State Building; in the left center, the buildings of the garment zone topped out by the Navarre Building; in the background at the left center, the spire of the Chrysler Building and at the left, the new McGraw-Hill Building, under construction.

mits granted by the supervisor of the harbor in water belonging to neither New Jersey nor the United States; second, that large quantities of garbage are dumped by others off the shore and that it is impossible to determine the source of the matter actually deposited on the beaches; third, that the complaint failed to state facts sufficient to entitle New Jersey to any relief. All of these the court held to be without merit.

New Jersey filed no exceptions to the master's report; New York excepted to substantially all material findings and conclusions. After considering the briefs and the arguments of counsel the court finds that the evidence abundantly sustains the master.

A period of about two years will be necessary before the practice of dumping at sea can be abandoned for incineration, according to the New York City department of sanitation. A program has already been prepared calling for the construction of fifteen incinerators at a cost of $17,375,000, exclusive of real estate. Because of the antagonistic attitude of neighboring property owners, some difficulty may be experienced in obtaining suitable sites for the incinerators.

Great Flood in Dnieper River

Reports received by Col. Hugh L. Cooper, consulting engineer to the Dnieprostroy hydro-electric plant of the Russian government, say that the uncompleted works have just passed a flood exceeding all records. The highest flood in 46 years of record up to now was 720,000 sec.-ft.; the flood just past reached 880,000 sec.-ft. This volume was safely passed through the openings between the piers of the uncompleted dam. No equipment or material was lost, though apparently some sections of the cofferdam, no longer required, were carried out.

Minneapolis Voters to Pass on Sewage-Works Levy

On June 8 the citizens of Minneapolis, Minn., will vote upon a proposed charter amendment that will enable the city to spend the proceeds from a 2½-mill tax levy for sewage-disposal purposes, including the construction of intercepting sewers and treatment works. Whether the system will be an independent project or part of a joint undertaking with St. Paul and, possibly, South St. Paul and Newport depends upon the outcome of present negotiations.

As noted in *Engineering News-Record*, April 30, p. 743, Gov. Olsen, of Minnesota, recently vetoed a bill providing for the construction of a joint system on the ground that Minneapolis and St. Paul would, under the proposed set-up, be forced to pay a considerable part of the cost of treating packing plant wastes from South St. Paul. Since that time South St. Paul has announced its willingness to withdraw from the plan, leaving the twin cities free to attack the problem independently. N. W. Elsberg and William N. Carey, city engineers of Minneapolis and of St. Paul, are now attempting to work out a plan of cost allocation that will permit the construction of a joint system. In the event that legislation proves necessary to put this plan into effect, the governor has promised to call a special session of the legislature.

Wrecked Span of Burrard Inlet Bridge to Be Replaced

With the passage at Ottawa of the bill which validates the act of incorporation of the Burrard Bridge Co. and which enables the bridge to be replaced, the company has called for bids for replacement of the 300-ft. span of Second Narrows Bridge, Vancouver, B. C., which was wrecked last September. By a judgment of the Privy Council, England, the bridge was termed a public nuisance, but on the score of urgent necessity the bill was passed to permit of repairs.

Cooperative Research in Heating and Ventilation

A new policy developed from the experience of ten years of cooperative research is announced by the American Society of Heating and Ventilating Engineers. Centalized control is continued through the chairman of the committee on research, with the assistance of a technical adviser. The director of the research laboratory will have charge of all investigations at the society's laboratory in the U. S. Bureau of Mines experiment station, Pittsburgh.

C. V. Haynes, chairman of the committee on research, announces that in line with the policy Arthur C. Willard, professor of heating and ventilation and head of the department of mechanical engineering, University of Illinois, has been retained as technical adviser for research. Prof. Willard is a past-president of the society and has been on the Illinois faculty since 1913. He was consultant on ventilation for the Holland tunnel and supervised much of the experimental work in connection with the ventilation methods used.

The society has renewed the contract with the U. S. Bureau of Mines, and the investigations at Pittsburgh will be in charge of F. C. Houghton, director of the research laboratory. The latest cooperative agreement made is that with the University of Illinois, the problems assigned to that institution to be under the supervision of Prof. A. P. Kratz. Cooperative agreements are now in effect with the U. S. Bureau of Mines, the Armour Institute of Technology, the Carnegie Institute of Technology, Harvard University, Texas Agricultural and Mechanical College, University of Illinois, University of Minnesota, University of Wisconsin, Washington University, St. Louis, and Yale University.

Twelve problems are being studied at present either at the research laboratory in Pittsburgh or at the nine cooperating universities, and other investigations will be undertaken as approved by the committee on research as finances permit:

1. Atmospheric dust- and air-cleaning devices.
2. Air conditions and their relation to living comfort.
3. Physiological effects of atmospheric environment on human beings at work.
4. Heat transmission through building materials.
5. Conductivity studies on concrete.
6. Heat capacity of concrete slabs.
7. Heating effect of the sun on buildings roofs and walls.
8. Infiltration of air through walls and building openings.
9. Boiler testing with oil fuel and rating of oil burners.
10. Measurement of air flow through registers and grills.
11. Characteristics of copper tubing for steam and hot water.
12. Performance characteristics of various inclosed types of cast-iron and nonferrous radiators under actual heating service conditions.

The expense for the committee on research and for work at the Pittsburgh laboratory and in contracts with cooperating institutions has been budgeted at $43,750 for 1931.

American Road Builders Outline Year's Program

Emphasis was placed on developing and continuing programs for road and street construction at the annual meeting of the American Road Builders' Association in Washington May 14-16. The program included meetings of the executive committee and the board of directors of the association and similar meetings of the city and county officials' divisions. Forty organizations interested in the development of roads and streets were represented at the annual dinner given in honor of W. A. Van Duzer, the retiring president, who was recently named as traffic director of the District of Columbia. W. R. Smith, president of the Lane Construction Co., Meriden, Conn., was installed as president.

Approval of the cooperative work with the Association of State Highway Officials, the U. S. Department of Commerce, the Associated General Contractors, the Highway Research Board and other organizations, was expressed, and it was agreed that these activities should be increased. A favorable recommendation was given by the county officials' division to the proposal for the advance planning of public works as a method of alleviating unemployment. Activities for the coming year include studies of uniform county planning, methods of state aid extension to counties, a manual for county planning, methods of promoting county bond issues, and aerial photography for planning. Otto Hess, engineer-manager of Kent County, Mich., will preside over the county officials' division for the coming year. The city officials' division outlined its future activities in the work of five committies covering design and construction, pavement financing, maintenance, traffic, and airports.

The 1932 convention and road show will be held in Detroit, Cleveland or Philadelphia, according to the recommendations of the executive committee of the manufacturers' division.

Engineering Council to Oppose Unwise Labor Legislation

All members of the American Engineering Council and its constituent societies were urged by the administrative board, in meeting May 15, to unite in opposing unwise labor legislation born of hysteria due to the depression. Deploring any attempt to do by law those things which industry can do much better for itself, the board issued a warning against those measures in particular which, while "ostensibly providing insurance, would really bring about the dole." Council's committee on public affairs was instructed to deal with the immediate situation by enlisting all member societies in a campaign "to counteract doctrines that might produce results adverse to the national well-being."

In addition the administrative board set up a committee on the relation of production, distribution and consumption to undertake a study looking toward solution of the unemployment problem; the board declared it to be more important that the solution be sound than that it be arrived at quickly. This committee will be composed of R. E. Flanders, of Springfield, Vt.; Dexter S. Kimball, dean, Cornell University; L. P. Alford, of New York; F. J. Chesterman, of Pittsburgh; and L. W. Wallace, Council's secretary.

Most important among the technical subjects upon which the board acted was its resolution authorizing L. W. Wallace, the secretary, to urge upon the appropriation committees of Congress and the bureau of the budget the removal of the restriction which limits the greater part of federal funds spent for topographic mapping of the United States to the amount appropriated by the several states. The resolution also calls for a larger appropriation to carry out this work.

Fire Protection Association Meets in Toronto

Delegates and guests to the number of 1,004 registered at the 35th annual convention of the National Fire Protection Association, held in Toronto, May 11-14, the largest attendance in the history of the association. The international character of the association was emphasized by the active participation of Canadian members, including a paper on the fire hazard of the pulp and paper industry by A. J. Mykea, of Toronto, and a discussion of plant fire department organization and methods by George H. Greenfield, of the Canadian Car & Foundry Co., Montreal.

Unusual hospitality of the local committee in nowise interfered with the attendance at the eight general sessions and one dinner during the four-day period nor at the various section and committee meetings which were held simultaneously.

The 65 items scheduled on the program included discussion and action on twenty preprinted technical committee reports, and a dozen papers, ranging in subjects from standards on fire-preventive measures in aviation to the influence of zoning on community fire hazards.

The report of the committee on piers and wharves was of particular interest because of the series of disastrous pier fires of the past few years and the inherent difficulties of applying to this class of property the standards of fire-resistive construction and fire protection that are employed for other classes of industrial property. The former standards of the association called for full fire-resistive or heavy timber construction, with all structural steel fireproofed. The action of the meeting, a radical departure from previous policy, was to recognize the use of bare structural steel under automatic sprinkler protection, subject to restrictions of height and area. Discussion centered on the problem of existing piers with wooden substructure and pier deck. Fires originating in such under deck spaces, inaccessible for firefighting operations, have been the principal cause of the large losses in pier fires. Automatic sprinklers are felt by fire-protection engineers to be the solution for the problem, but objections have been made by pier authorities on account of difficulties of maintenance owing to corrosion and the possibility of theft of sprinkler heads. The recent decision of New Orleans to install sprinklers under her wharves and the favorable experience of Seattle, where sprinklers have been successfully maintained under one pier for twenty years, were the deciding factors in the vote of the association to recommend automatic sprinklers for the protection of the under deck space of existing piers. In accordance with the usual N.F.P.A. policy of consulting with the interests concerned before taking action, this vote was not taken until Billings Wilson, of the Port of New York Authority, representing the American Association of Power Authorities, had agreed to the proposed wording. For new construction, the problems can be met, according to the provisions of the report, by the use of concrete piles with a concrete pier deck, or, where wooden piles are used, by non-combustible construction above a low pile cutoff.

The recommendations of the committee on construction operations, covering the fire hazards and fire-extinguishing equipment of buildings in course of construction, tentatively adopted a year ago, were officially adopted, subject to a final decision on the extent to which ordinary wood scaffolding may be permitted. The use of wood chemically treated to reduce its inflammability, recommended by the committee, was further discussed in a paper on the fireproofing of wood presented by T. R. Truax, of the Forest Products Laboratory, U. S. Department of Agriculture.

Officers elected for the next year included: president, Frederick T. Moses, president Firemen's Mutual Insurance Co., Providence, R. I.; vice-presidents, Sumner Rhodes, Eastern Underwriters Association, New York, and Harold L. Miner, Du Pont Co., Wilmington, Del.; secretary-treasurer and managing director, Franklin H. Wentworth, Boston.

WASHINGTON NOTES

By PAUL WOOTON

Washington Correspondent

Technological Unemployment to Be Studied—Government Officials Discouraging Wage Reductions

NINE men and one woman have been drafted by Secretary of Labor Doak to rout the bugaboo of technological unemployment. It is probable that this committee, of which C. A. Prosser, of the Dunwoody Institute, Minneapolis, is chairman, will seek to establish the true extent of technological unemployment rather than attempt now to find a remedy for the displacement of men by machines.

Dr. Prosser's associates on the committee, all of Washington, D. C., are: Perry W. Reeves and J. C. Wright, of the federal Board of Vocational Education; A. O. Wharton, president, International Association of Machinists; F. C. Croxton, acting director, President's Emergency Committee on Employment; John P. Frey, secretary, metal trades department, American Federation of Labor; John R. Alpine, supervising director, U. S. Employment Service; Mrs. Josephine Barron, superintendent, clothing, textile and needle trades section, U. S. Employment Service; Lawrence W. Wallace, executive secretary, American Engineering Council; and E. E. Hunt, U. S. Department of Commerce.

Government Against Wage Cuts

Apparently there is a concerted effort on the part of government officials to exert their utmost influence to stem the tide of wage reductions. At their press conferences and in personal conversations officials point out the advantages of maintaining present wage levels. The feeling is that reduction in wages can make only a small cut in production cost. With production costs already low, it is asked why more attention is not given to distribution, which is loaded with waste. There never was a time, it is pointed out, that lent itself better to a critical analysis of distribution costs.

Private Architects Reassured

Calling upon President Hoover to protest that the alleged reluctance of the treasury department to turn over preparation of plans and specifications to outside architects is slowing up the federal public buildings program, a delegation representing the Associated General Contractors, the American Institute of Architects and the American Engineering Council was informed that approximately 75 per cent of this work has been placed in private hands. A

report by the treasury department to the President reveals that the drawings for most of the large projects have been assigned to private architects. While only 58 of the 201 projects now in the drawing stage have been placed in the hands of private architects, these total $169,017,023, compared with a total of $46,171,700 for the 143 projects that the supervising architect has in hand. Of the 46 projects over $1,000,000 which have been taken up for drawings since March 31, 1930, 32, to cost $163,989,023, have been assigned to architects outside the department.

As a result of the White House conference it has now been decided that as new sites are accepted all jobs that the supervising architect's staff can not handle within 30 to 60 days will be assigned to private architects.

Capital and Contracts

Inclusion of the $52,000,000 New York City rapid transit construciton 3s brought the total of new capital issues for the week to 61 millions. Figures for the year are 864 millions private, 914 public, a total of $1,778, compared with a total of 3,406 in 1930.

	1931	1930	1931 as per Cent of 1930
Railroads	245	465	53
Public utilities	473	987	48
Iron, steel, coal	103	111	93
Equipment	12	13	92
Motors, accessories		6	
Other industrial	97	260	37
Oil	8	141	6
Land, buildings	24	127	19
	962	2,110	46

Contracts to date total 1,098 millions, compared with 1,382 last year. Although the volume in the last six weeks is 25 per cent under that of the same period of last year, the week-by-week figures are remarkably even, being as follows for the six weeks March 26 to May 14: 60 millions, 65, 55, 57, 59, 59 millions.

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost			Volume	
May 1, 1931	189.33	April,	1931	289
Apr. 1, 1931	191.63	March,	1931	278
May 1, 1930	205.86	April,	1930	320
Average, 1930	202.85	Average,	1930	260
Average, 1929	207.02	Average,	1929	317
1913	100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of May 21, with some comparisons, total as follows:

(In Thousands of Dollars)

	May 21, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$5,405	$3,167	$10,213
Other	19,808	17,626	35,647
Streets and roads	18,524	19,151	17,364
Other eng. constr.	16,624	19,066	21,225
Total	$60,361	$59,011	$84,477
Total, all classes, Jan. 1 to May 21:			
1931			$1,158,815
1930			1,469,454

Personal Notes

CHARLES A. RICE has been elected city engineer of McAllen, Tex.

ARTHUR R. WELLWOOD, resident engineer for Murray & Flood on the construction of Saluda dam, has opened an office in Columbia, S. C., for the practice of general engineering and construction.

JOHN N. EDY, who resigned recently as city manager of Flint, Mich., has been elected the first city manager of Dallas, Tex. Mr. Edy was graduated in engineering from the University of Missouri and before going to Flint was city manager of Berkeley, Calif.

RAYMOND M. HOOD, FREDERICK A. GODLEY and J. ANDRÉ FOUILHOUX announce the dissolution by mutual consent of the firm of Raymond Hood, Godley & Foulihoux as of March 31 and that Mr. Hood and Mr. Fouilhoux will assume the unfinished business of the firm and continue the practice of architecture under the firm name of Hood & Fouilhoux, with offices, as formerly, in New York City.

HERBERT H. HARMAN, who has been engineer of bridges and buildings of the Bessemer & Lake Erie R.R., has been appointed engineer of track. He is succeeded by JOHN S. EKEY, who has been supervisor of structures. REGINALD RIDGE, field engineer, succeeds Mr. Ekey.

ALBION DAVIS, who has been chief engineer of the Mississippi River Power Co., has been appointed chief hydraulic engineer for the Union Electric Light & Power Co.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; summer meeting, Tacoma, Wash., July 8-10.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; 34th annual meeting, Chicago, June 22-26.

AMERICAN WATER WORKS ASSOCIATION, New York; annual convention, Pittsburgh, Pa., May 25-29.

INTERNATIONAL RAILWAY FUEL ASSOCIATION, at a meeting of its executive committee in Cincinnati on May 11, decided to postpone the annual meeting, usually held in May, until Sept. 15-16. The addresses and committee reports will be strictly limited to those having a direct bearing on fuel performance, as reflected in increased railway operating efficiency.

MOHAWK VALLEY (N. Y.) ENGINEERS CLUB has elected the following officers: president, John T. Robertson, chief engineer, Consolidated Water Co., Utica; first vice-president, W. C. Cahill; second vice-president, Leslie A. Stewart; third vice-president, George H. Briggs; secretary-treasurer, Howard C. Fuller.

MONTANA SOCIETY OF ENGINEERS at a meeting May 11 at Butte, received the report of the nominating committee for officers for 1931-32 as follows: president, Frank Scotten, Great Falls; first vice-president, Morgan Wright; second vice-president, A. E. Blair; secretary, L. G. Gage; treasurer, A. E. Adami. The report will be formally ratified at the annual meeting in Butte, Sept. 25-26. At the May 11 meeting addresses were given by R. P. Newlands, maintenance engineer, state highway commission, and B. J. Ornburn, state bridge engineer.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS at the fourth annual convention held in New York City on May 16 adopted resolutions urging engineering schools and colleges to revise their curricula in order to conform more nearly with the requirements of licensing bodies and upholding the unity of the engineering profession, opposing any legal division into specialties. Officers elected included the following: president, D. B. Steinman; vice-presidents, Arnold G. Chapman and Harry A. Kidder; secretary, Ernest F. Fox, Jr.; treasurer, Patrick M. Corry.

SOUTH CAROLINA SOCIETY OF ENGINEERS will hold its summer convention in Spartanburg, June 18-19. William S. Lee, of Charlotte, N. C., chief engineer and vice-president of the Duke Power Co. and also president of the American Institute of Electrical Engineers, will be the principal speaker.

Obituary

FREDERIC ADAMS REIMER, of East Orange, N. J., consulting engineer and past-president of the American Road Builders' Association, died suddenly of heart disease on May 18. Mr. Reimer was born in East Orange in 1874. From 1895 to 1908 he was assistant city engineer of East Orange and in 1909 he succeeded his father as city engineer. In 1911 he entered private practice as a consulting engineer, but in 1912 he re-entered public service as assistant county engineer of Essex County and from 1913 to 1921 was county engineer. Mr. Reimer took great interest in the American Road Builders' Association and was instrumental in raising that organization to its present eminent position. In 1929 he was elected president. He was also a member of the American Society of Civil Engineers.

EDMUND ARTHUR STANLEY CLARKE, secretary of the American Iron and Steel Institute, died of pneumonia on May 15 at his home in Rumson, N. J. He was 69 years old. Mr. Clarke was a native of Ottawa, Canada, and was graduated from Harvard in 1884. He held responsible positions with the Union Steel Co., the Illinois Steel Co., the Deering Harvester Co. and the International Harvester Co. In 1904 he became president of the Lackawanna Steel Co., resigning in 1918 to accept the presidency of the Consolidated Steel Corp. When this corporation was dissolved in 1922 he was elected secretary of the American Iron and Steel Institute.

JOHN SIMPSON WALKER, of Nashville, Tenn., died on May 12. Mr. Walker was born 82 years ago in Florence, Ala., but had resided in Nashville 40 years. He was a graduate of the University of Virginia and as an engineer aided in the construction of the Birmingham water-works system, the Cumberland River locks and dams and other projects. He was a member of the American Society of Civil Engineers.

AUGUSTUS A. DERDENGER, president of the Derdenger Construction Co., of Buffalo, N. Y., died of heart disease on May 10 on the liner "Ile de Paris" while returning from a visit to France. Mr. Derdenger was a member of the Associated General Contractors of America.

Construction Equipment and Materials

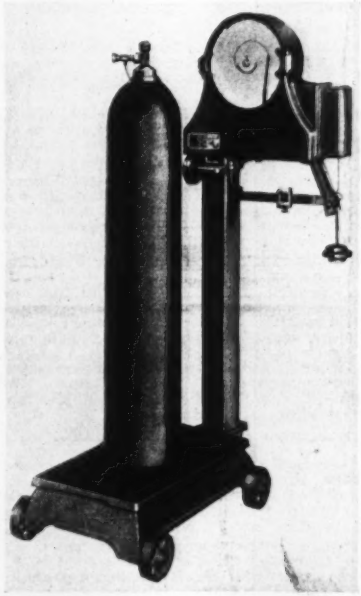
Welding Rod for Hard Surfacing

General sale of the Amsco manganese steel welding rod, developed by the research department of the American Manganese Steel Co., Chicago Heights, Ill., for use in its own plant, has been inaugurated in response to a demand by the company's customers. The composition used is covered by patent application and has a manganese content of from 13½ to 14 per cent. This, together with other important elements, gives a deposit with the electric arc-welder equal in toughness and wear resistance to manganese steel, according to the company. The rod can be used for repairing or building up either manganese steel castings or those made of other steels. The rod comes in 5-gage pieces 36-in long.

The American Manganese Steel Co. also produces the Amsco No. 459 welding rod for hard-surfacing, which costs considerably less. This material comes in the form of a cast rod about ⅝ in. in diameter and is used for hard-surfacing dipper-teeth, pulverizer hammers and other parts subjected to severe wearing action.

Scale Records Chlorine Flow

Permanent records showing the amount of chlorine fed over a given period of time, as well as the rate of flow, are obtainable from the Chloro Scale, a new product of the Wallace & Tiernan Co., Inc., Newark, N. J. This unit can be furnished to meet any requirements up to and including 5,000 lb., a range which adequately services the smaller plant using one cylinder of chlorine at a time or the large plant using batteries of eight or ten cylinders. The records produced are not only valuable in the case of litigation, but are a great aid in the correct and efficient operation of the plant.



Automatic recorder of chlorine flow

Field Instrument Warns of Pipe Corrosion Danger

As a result of the study of corrosion on underground pipes which the U. S. Bureau of Standards has been carrying on for several years a new instrument has been developed for simply and quickly measuring in place the electrical resistivity of soils, thus eliminating the necessity for removing samples to a laboratory for examination. The bureau has found that soils high in soluble salts, and therefore low in electrical resistivity, are usually highly corrosive to pipe lines. Such low-resistance soils are frequently found as outcrops or pockets in areas otherwise normal. Predetermination of such areas is a matter of great importance to the pipe line companies as well as to utility operators, as this knowledge will enable them to provide suitable protection to their pipes in exceptionally corrosive soils.

Soil resistivity meter

The Shepard earth resistivity meter consists of two rods or canes tipped with iron electrodes, which are pushed into the earth about one foot apart at the bottom of a pair of auger holes, a shallow excavation, or along the side of an open trench. A flashlight battery and a milliammeter are mounted in a light aluminum frame on one of the rods. When the circuit is closed the resistivity of the soil is read directly in ohm-centimeters on the scale of the instrument.

A unique feature of the apparatus is the manner in which polarization has been overcome or minimized, so that accuracy closely approaching an a.c. bridge determination is attained. This has been accomplished by making the cathode very much larger than the anode. Polarization, which is largely a cathode effect and is also a function of current density, is greatly reduced by employing electrodes differing greatly in areas.

Two scales are provided on the meter, one ranging from 400 to 10,000 ohm-cm. and the other from 100 to 500 ohm-cm. Provision is also made for checking the voltage of the three-volt flashlight battery carried in the handle of the rod. The meter, which was developed by E. R. Shepard, of the Bureau of Standards, is being built and distributed by O. S. Peters, of 930 H St., N. W., Washington, D. C. It is already being employed by several large pipe line companies in Texas and in California in connection with their reconditioning programs.

Crane for Tractor Mounting

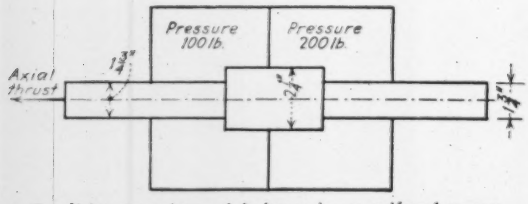
By varying the dimensions of its model MCF crane, the Sterling Tractor Equipment Co., 62 Bush St., Brooklyn, N. Y., is able to offer this model for ready attachment to Case, Fordson or McCormick-Deering industrial tractors without the necessity of any alteration to the tractor itself. This important feature permits direct shipment to the tractor dealer, who can mount the unit for delivery to the consumer. The crane itself has an adjustable boom which will pass through a 9-ft. doorway and can be lifted to a maximum height of 16 ft. from the hook to the ground. Special booms are also available for unusual requirements. Lifting and carrying capacities range from 2 to 4 tons, depending upon the tractor used.

Crane unit for industrial tractor

End Thrust Reduction in Multiple-Stage Pumps

As the result of a series of centrifugal pump tests carried on at the University of California by A. J. Stepanoff, a simple method of effecting a considerable reduction in the end thrust experienced with multi-stage centrifugal pumps has been adapted to products of the Byron Jackson Co., Berkeley, Calif.

In multiple pumps the impellers are usually arranged in pairs set back to back. Although this arrangement should apparently give perfect hydraulic balance, because the thrust on one impeller is balanced by that on its companion, it was nevertheless found that a residual end thrust, which might reach considerable proportions at high speeds, is caused by the difference in water pressure in the two chambers acting on



Conditions causing axial thrust in centrifugal pumps

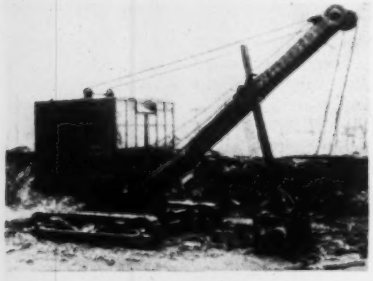
an effective difference in main shaft diameters. This condition is represented diagrammatically in the illustration, which shows a shaft of varying diameter passing through two chambers, one under a pressure of 100 lb., the other under 200 lb. per sq.in. In this case the shaft would tend to move to the left because of the pressure difference acting on the shoulder. In practice, this shoulder is formed by the impeller hub, and the fact that the shaft may be rounded off or tapered makes no essential difference in the action.

The simple and effective means taken to eliminate this thrust consists in adding collars placed in such a way that a balancing axial thrust opposes that due to the difference in pressure.

½-Yd. Shovel Has Few Parts

A fully convertible, full-revolving ½-cu.yd. shovel completely equipped with two drums and boom hoist but built with less than one-half the parts ordinarily used in similar machines has been brought out by the Pontiac Tractor Co., Pontiac, Mich. This machine, known as the Wright excavator, is made of heat-treated alloy steel castings, uses roller bearings on all bearings turning over 20 r.p.m., full force-feed lubrication to other slow-speed, heavy-duty bearings and contains only three pairs of gears.

The hoist is made by removing the rear axle and differential of the McCormick-Deering 20 industrial tractor and substituting a chrome-nickel shaft mounted on four brackets with Hyatt roller bearings. This gives a hoist driven through an inclosed transmission with hardened gears running in a bath of oil. The cross-shaft, of chrome-nickel steel, is driven by two roller chains from the ends of the drum shaft, thereby dividing all strains on this shaft. Swinging gears are actuated by self-energized cone clutches, one of which rotates the shovel in each direction.



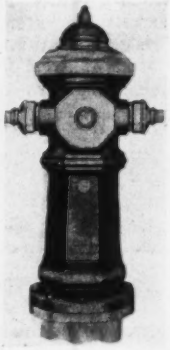
½-cu.yd. convertible excavator

This eliminates backlash when reversing. Traction is through two steel gears carried on the cross-shaft which slide into mesh with gears carried on a stub shaft between main frame and caterpillar. Final drive is through roller chain to the caterpillar sprocket.

The boom is made of 8-in. welded box-section channels, and is altered for trench hoe, clamshell and dragline operation without removal from the machine. The change can be made in the field with a minimum amount of time and labor. For the shovel, the boom length is 16 ft. and dipper handle 10 ft. 6 in. Crane boom extensions are available with lengths of 30, 35 and 40 ft.

Hydrant Design Combines Beauty and Utility

Growing interest in the appearance of highways has led the Ludlow Valve Mfg. Co., Troy, N. Y., to devote particular attention to sightliness in the design of a new fire hydrant known as the Ludlow Diamond. The octagonal shape selected has clean lines and excellent proportions, giving an effect of massive strength and modern simplicity and at the same time providing eight flat surfaces, which, when painted with aluminum paint, facilitate quick location of the hydrant in time of emergency. Many pleasing and decorative color effects can readily be worked out with various paints.



Octagonal hydrant

A feature of the new hydrant that is particularly desirable in replacement work is its design in three parts: body, connecting barrel and bottom section. These are held together by flange connections. The hydrant body is so designed that any breakage caused by impact will occur just above the flange and the broken part can be readily replaced by releasing eight bolts and substituting a new unit. As this connection is just above the ground surface, no digging is required. The bottom section contains a Ludlow valve with a gate which is forced squarely against its seat by a wedge nut. Once the gate is closed it cannot be pulled free, even if the hydrant body is broken, and can be released only by turning the valve stem. Connecting barrels come in various lengths, so that variations in grade can be compensated for by selecting the proper length of section and connecting it to the two other parts.

Business Notes

NATIONAL LUMBER MANUFACTURERS ASSOCIATION at its recent annual meeting in Chicago elected the following officers: president, A. C. Dixon, Eugene, Ore.; vice-presidents, W. M. Ritter, Washington, D. C.; E. A. Frost, Shreveport, La., and R. B. White, Kansas City, Mo.; secretary and manager, Wilson Compton, Washington, D. C.

APPALACHIAN HARDWOOD CLUB, Cincinnati, Ohio, reports the appointment of Carl H. Clendening, Nashville, Tenn., as special assistant to David G. White, trade extension manager.

NATIONAL SLAG ASSOCIATION held its fourteenth annual meeting recently at Cleveland, Ohio. All officers were reelected, and a program of research was authorized that will be slightly larger than in any past similar period.

SIMPLIFIED PRACTICE RECOMMENDATION R1-29 on vitrified paving brick has been reaffirmed by the standing committee of the industry, without change, for another year. This recommendation has been instrumental in reducing the number of sizes and varieties from 66 to 6, or 91 per cent.

INTERNATIONAL ROAD MACHINERY EXPOSITION will be held July 20-26 at Los Angeles, Calif. This new show is under the direction of E. G. Lenzner, P. O. Box 338, Watts Station, Los Angeles.

STEPHENS-ADAMSON MFG. CO., Aurora, Ill., has appointed C. H. Adamson district manager of the Chicago office, which has been moved to new quarters at 20 North Wacker Drive.

TRUSCON STEEL CO., Youngstown, Ohio, announces the appointment of Garrett A. Connors as vice-president, director of purchases, in recognition of his 24 years of service as an executive in the production division. Mr. Connors will maintain headquarters at Youngstown.

GRINDLE FUEL EQUIPMENT CO., Harvey, Ill., a subsidiary of the Whiting Corp., has purchased manufacturing and selling rights to the Bethlehem pulverizer, formerly manufactured by the Bethlehem Steel Co.

INLAND STEEL CO., Chicago, Ill., has elected J. H. Morris secretary. He succeeds W. D. Truesdale, who has served as both secretary and treasurer and who remains treasurer.

LINK-BELT CO., Chicago, Ill., has appointed William L. Hartley district sales manager in charge of the Detroit territory. Mr. Hartley since 1928 has been in charge of the foundry sales division of the company.

HOMELITE CORP., Port Chester, N. Y., has appointed J. A. Abbott sales manager. Mr. Abbott was previously associated with the Hedge & Mattheis Corp., New England distributor of contractors' equipment.

OHIO LOCOMOTIVE CRANE CO., Bucyrus, Ohio, has appointed F. H. Hopkins & Co., Ltd., of Montreal and Toronto, Canada, its agent for eastern Canada.

BALDWIN-SOUTHWARK CORP., Philadelphia, Pa., announces the appointment of Francis Buckingham as sales engineer on testing machinery and equipment.

R. E. BROOKS CO., 50 Church St., New York City, has been appointed distributor for the Monarch tractor in the New York territory.

BYRON JACKSON CO., Berkeley, Calif., announces the return of W. R. Layne to its sales force after an absence of a year.

DAYTON-DOWD CO., Quincy, Ill., has appointed M. B. MACNEILLE as Western sales manager, with headquarters at San Francisco. He was formerly with Fairbanks, Morse & Co. as manager of the pump division.

MCKIERNAN-TERRY CORP., New York City, has acquired the Lambert Hoisting Engine Co., Newark, N. J., including all designs, patents, machinery and inventory, which will hereafter be known as the Lambert hoisting engine division of the McKiernan-Terry Corp., in charge of John A. Lambert. Sales activities for the two companies will be concentrated at 15 Park Row, New York City; manufacture at the McKiernan-Terry works at Harrison, N. J.

SAMUEL F. KALLENBAUGH, sales manager of the Morgan Engineering Co., Alliance, Ohio, died suddenly on May 8 at the age of 61. He had been associated with that organization for 34 years.

EARL H. BROWNING, vice-president of the Ohio Gear Co., Cleveland, Ohio, died May 2 at the age of 53. Mr. Browning, a graduate of Purdue University, was co-founder with the late B. F. Miles and Victor R. Browning of the Browning Engineering Co.

CONSTRUCTION NEWS

CONTENTS

	Page
Engineering Structures:	
Airports	227
Bond Elections	220
Bridges	215a
Dams	222
Equipment	223
Excavation	220
Federal Government	220
Federal Power Comn.	221
Foreign	223
Grade Crossings	221
Grain Elevators	222
Heating and Ventilating	222
Materials	223
Parks and Sports	222
Piers and Wharves	222
Power and Lighting	222
Railways	221
Sewers	215a
Streets and Roads	216
Subways and Tunnels	221
Waste Disposal	215a
Waterwosks	215
Unclassified	222
Industrial Buildings	
Factories and Mills	226
Garages	227
Power Plants	227
Shops and Foundries	227
Warehouses	227
Commercial Buildings	
Banks	225
Churches	224
Clubs	223
Hospitals	223
Offices	225
Public	226
Residential	223
Schools	224
Stores	226
Theatres	225
Unclassified	226

WATERWORKS

PROPOSED WORK

Calif., Mill Valley—City Council furnishing, installing c.i. pipe system, valves, hydrants, $50,000. E. K. Hussey, Syndicate Bldg., Oakland, engr.

Conn., Hamden (br. New Haven)—Town, bids in June 3 story, 16 x 18 ft. pumping station, and sewers at Spring Glen, $50,000. F. W. Wright, Town Hall, engr.

Ia., Council Bluffs—See "Public."

Neb., Lincoln—City, water supply wells on Platte River, near Ashland, $2,300,000 voted. D. L. Erickson, city engr. This corrects report in May 7 E. N.-R.

N. H., Wilton—Town concrete core earth dam, concrete reservoir, 2,000 ft. 12 in. c.i. pipe, $20,000. Weston & Sampson, 14 Beacon St., Boston, Mass., engrs. Noted Mar. 26.

N. J., Haledon—Bd. Boro Council, Boro Hall, extending mains, installing fire hydrants, $15,000. Schilling & Spinnler, 242 Main St., Paterson, boro engrs.

N. J., Haledon—Bd Boro Council, Boro Hall, filtering plant at Haledon Reservoir $120,000. **Maturity indefinite.** A. T. Cook, 158 Ellisen St., Paterson, engr. Noted Apr. 9.

N. J., Newark — North Jersey Dist. Water Supply Comn., 24 Commerce St., concrete dam at Split Rock Pond to supply water to Jersey City, Hoboken and Lyndhurst, $25,000 or more. **Maturity probably soon.**

O., Cincinnati—Waterworks and power plant, $2,700,000. Burns & McDonnell Eng. Co., 406 Interstate Bldg., Kansas City, Mo., engrs.

Okla., Prague — City Council preliminary plans new air lift equipment for wells, $5,000. A. Newhouse, city clk.

Okla., Sapulpa—Preliminary plans rebuilding waterworks pumping plant, $174,982. O. S. Kelley, Oklahoma City, engr. A. Higginbotham, city mgr.

Okla., Tulsa — Preliminary plans raising present dam at Lake Spavinaw, $100,000. H. A. Parker, city Hall, engr.

Pa., Lancaster—Filter plant, $500,000. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engrs.

Tex., Beaumont—City, c/o E. A. Fletcher, Beaumont, 12,000 g.p.m. centrifugal pump for Weiss-Bluff Pumping Station, $4,500. Hawley, Freese & Nichols, 411 Capps Bldg., Fort Worth, engrs.

Ont., Arthur—Village waterworks, incl. mains, wells, house services, hydrants, valves, reservoir, $25,000. Engineer not selected.

Ont., Bolton—Village waterworks, incl. water supply, mains, hydrants, valves, pumps, house services, $25,000 up. Engineer not selected.

Ont., Tilbury — Town Council, A. Taggart, mayor, waterworks, $90,000. Engineer not selected.

Ont., Toronto—Extending waterworks, incl. 24 in. c.i. watermain in St. Clair Ave. W. $135,000. R. C. Harris, City Hall, engr.

Ont., Toronto—York Twp., 3,300 ft. 12 in. c.i. mains, Bathurst St. $25,000. T. S. Scott, 40 Jarvis St., engr.

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	*Project*	*Cost*	*Status*
Waterworks			
Cincinnati	Waterworks and power plant	$2,700,000	Proposed
Sewers			
Lancaster (Pa.)	Sewage disposal plant	1,000,000	Proposed
Streets and Roads			
New Jersey	Road	1,194,564	Contract
Railways			
West Virginia	Tunnels and bridges	1,564,500	Contract
Excavation and Dredging			
Chicago	Fill	3,062,000	Contract
Piers and Wharves			
Long Beach (Calif.)	Pier	1,000,000	Proposed
New Jersey	Piers	20,000,000	Proposed
New York	Piers	7,500,000	Proposed
Sports and Parks			
Cleveland	Sports arena, etc.	3,500,000	Proposed
Federal Government			
San Rafael (Calif.)	Bombing base	5,000,000	Proposed
Chicago	Appraisers stores	1,500,000	Proposed
Fort Worth (Tex.)	Post office	1,245,000	Proposed
Factories and Mills			
New York	Baking plant	1,000,000	Proposed
Euclid (O.)	Manufacturing plant	1,000,000	Proposed
Newton Falls (O.)	Rolling mill	1,000,000	Proposed
Corpus Christi (Tex.)	Oil refinery	1,000,000	Bids asked
Corpus Christi (Tex.)	Chemical plant	10,000,000	Proposed
Power Plants			
Saulte Ste. Marie ((Ont.)	Hydro electric plant	1,000,000	Proposed
Buildings			
Oklahoma City	Church	1,000,000	Proposed
St. Louis	Office	2,500,000	Proposed
Toronto (Ont.)	Office	1,500,000	Proposed
Attica (N.Y.)	Prison	1,641,264	Contract
Dorchester (Mass.)	High school	1,400,000	Proposed
New York	University library	1,000,000	Proposed
Denver	Theatre	1,000,000	Contract

BIDS ASKED

Ga., Thomasville — June 8, by City, 1½ m.g.d.c. water softening plant, incl. concrete, rein.-con. mixing chamber, sedimentation tanks, brick equipment house and steel washer tank, $50,000. Wiedeman & Singleton, Candler Bldg., Atlanta, engrs. Noted Apr. 30.

La., Spring Hill—Bids about May 26, waterworks, distribution system, $35,000. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

Md., Cumberland—May 27, by Mayor, dam site in valley of Evitts Creek, Bedford Co., Pa., 2 mi. north of Gordon dam and about 12 mi. north of here, solid concrete, gravity type, with 80 ft. maximum height 726 ft., rein.-con. bridge with 22 ft. roadway, two 24 ft. sidewalks, for Mayor and Evitts Creek Water Co., Cumberland. J. E. Greiner Co., 1201 St. Paul St., Baltimore, engrs.

Mass., Woburn—June 4, at office H. V. Macksey, supt. P. Wks., driving test wells, developing ground water supply, Metcalfe & Eddy, 1306 Statler Bldg., Boston, engrs.; adv. E. N.-R. May 21.

N. J., Chatham—June 1, by Boro Council, C. Prager, boro clk., deep well, appurtenances, Clyde Potts, 30 Church St., New York, consult. engr.; adv. E. N.-R. May 21.

N. J., Lodi—See "Contracts Awarded."

N. J., Oakland—June 3, by Bd. Boro Council. Boro Hall, water distribution system, $80,000. J. Demarest, boro engr. Noted Mar. 19.

N. Y., Creedmoor—May 27, by Dpt. Mental Hygiene, State Office Bldg., Albany, F. W. Parsons, comr., driven wells, at Creedmor Div. Brooklyn State Hospital.

N. Y., New York—May 26, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, electric driven pumping plant and discharge main at gate house, Croton Lake, also ventilating and heating system. Noted Apr. 30.

N. Y., New York—June 2, by Bd. Water Supply, 346 Bway., G. J. Gillespie, pres., test-borings in towns of Kent and Carmel, Putnam Co. and Somers, North Salem, Lewisboro, Bedford, Newcastle, and North Castle, Westchester Co., Contr. 312; adv. E. N.-R. May 21.

N. Y., St. George—May 26, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Larson Court, Cottage, Mercer and Prospect Pls., Bond, Faber, Florence and Summit Sts., Barnes, Brighton, Davis, Dehart, Delafield, Granite, Grove, Harrison, Hendricks, Nelson, Richmond, Wheeler and Westervelt Aves.

N. D., Grand Forks—May 27, by City, C. J. Evanson, aud., 1 story, 83 x 95 ft. brick, hollow tile water treatment plant, rein.-con. chambers, 40 x 40 ft. on top, and 12 x 14 x 16 ft. mixing plants, $53,000.

Pa., Roaring Springs — See "Contracts Awarded."

Wash., Seattle—See "Streets and Roads."

Ont., Ottawa—June 4, by Bd. Control, City Hall, furnishing, installing one 17 m.g.p.d. high lift, one 17½ m.g.p.d. low lift and two 5 m.g.p.d. wash water pumps, electrically controlled for filtration plant, $20,000. Gore, Nasmith & Storrie, Confederation Life Bldg., Toronto, engrs.

Ont., St. Thomas—June 3, by W. C. Miller, city engr., waterworks filtration plant, supplying and installing equipment, in connection with filtration plant addition, $90,000. Gore, Nasmith & Storrie, Confederation Life Bldg., Toronto, consult. engrs. Noted Apr. 30.

Ont., Toronto—June 16, by W. J. Steward, mayor, City Hall, surfacing 16, 20, 24, 30, 36 and 42 in. c.i. special waterworks castings, Tender 45; supplying, erecting 8 water tube steam boilers in John St. Pumping Station, Tender 46, $200,000 or more. R. C. Harris, City Hall, engr.

CONTRACTS AWARDED

Calif., Fontana — P. S. Hasbrouck, mgr. Fontana Mutual Water Co., furnishing, installing deep well turbine pump ir 20 in. well, to Layne & Bowler, 900 Santa Fe Ave., Los Angeles, $18,811. Noted May 7.

Ia., Audubon—City Council, waterworks, incl. one 225,000 gal. and one 25,000 gal. reservoirs, valves, flow meter, pipe line labor, sewers, manholes, concrete anchors, to Robeck-Humphreys Co., 510 Securities Bldg., Omaha, Neb., $31,500; deep well turbine pumps, 4 flexible couplings, to Layne-Western Co., Mutual Bldg., Kansas City, Mo., $2,679; horizontal centrifugal pumps, to Interstate Mchy. & Supply Co., 1006 Douglas St., Omaha, Neb., $2,326; pump house, booster station, to C. Thomsen, Audubon, $5,400; tubular wells, to E. C. Archibald, 2200 Avenue A, Council Bluffs, $2,200. Grand total $44,105. Noted Apr. 30.

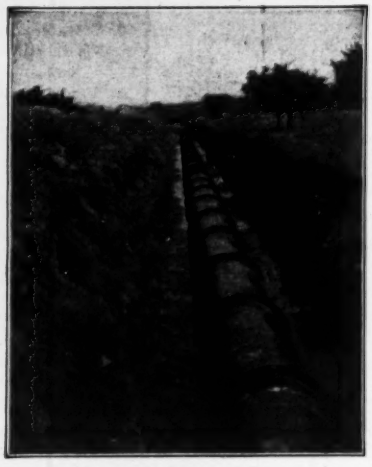
Me., Portland—City Water Dist., 36 in. electric welded steel pipe line, to C. & R. Constr. Co., 75 Bradeen St., Roslindale, Mass., $48,955; 48 in. rein.-con. pipe line, to Locke Joint Pipe Co., Ampere, N. J., $197,000. Noted Apr. 16.

See proposal advertising on page 152

Constr. News page 215

LEADITE

Trade-Mark Registered U.S. Pat. Office



At Albany—The World's Largest Cast Iron Water Main Installation is completed - - - - - - - - - - - - *and it is jointed with LEADITE*

This 20 miles of supply main, across country and beneath City streets, required approximately 48,000 tons of large diameter bell and spigot pipe. Particular attention is called to the unusual tightness of the line, as shown by the results of tests given below. ENGINEERS: Whitman, Requardt & Smith, Albany, N.Y., and Baltimore, Md. CONSULTING ENGINEER: Robert E. Horton, Voorheesville, N. Y. . . . CONTRACTORS (Sections 4 and 5—15.0 miles): Pepper Bros., Contractors, Inc., Syracuse, N. Y. . . . CONTRACTORS (Section 9—4.6 miles): A. Phelps & Sons, Detroit, Michigan. . . . SUB-CONTRACTOR (Section 9): Ole Johnsen, Port Huron, Michigan. . . . CONTRACTOR RAILROAD UNDERCROSSINGS: J. J. Farley Corporation, Croton-on-Hudson, N. Y.

Results of Final Tests — Albany Supply Conduit

Section No.	Length of Pipe	Allowable Leakage G.P.M.	Actual Leakage G.P.M.	Actual Leakage Gallons per Day per inch Mile
Entire Supply	18.297 Mi.—48″	.....	.....	..
Conduit-Sections	1.288 Mi.—42″	.....	.....	..
Nos. 4, 5 and 9	0.048 Mi.—36″	.....	.....	..
	19.633 Mi.—Total	194.595	45.608	70

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building - - - Philadelphia, Pa.

No Caulking

Waterworks (Continued)

Mass., Falmouth—Town, C. A. Griffin, Bd. Water Comrs., pumping equipment, to Turbine Equipment Co. of New England, 80 Federal St., Boston, $7,325. Noted Apr. 23.

Mich., Detroit — Dpt. Water Supply, 735 Randolph St., furnishing, installing electric power service system for Springwells Station, Pumping and Power Plants, to McClery-Harmon Co., 2470 West Grand River Ave., $397,600.

Minn., Moorhead—City, 7,025 lin.ft. 12 in. c.i. pipe, 9 hydrants, 31 gates, to St. Cloud Constr. Co., St. Cloud, $19,808.

Mo., Monett—City, general contract 500,000 gal. steel tank on tower, concrete found., to M. E. Gillioz, Monett, on cost plus 10% basis. Will sub-let standpipe in place. Bids in. Noted Apr. 23.

N. J., Hackensack—Hackensack Water Co., Temple Ave., furnishing, installing 8 mi. 52 in. lock bar pipe, involving 6,500 tons steel, from New Milford Pumping Station at New Milford, through Bergenfield and Teaneck to Englewood, to T. A. Gillespie Co., 7 Dey St., New York.

N. J., Lodi—Bd. Boro Council, Boro Hall, 6 in. c.i. mains in Cottage and Hillside Pls., Terrace, Roosevelt, Hillcrest and Sherman Aves., Richmond, Hunter, Mary, Walnut, Wisse, Victor, Boyd, Money, Millbank and Brook Sts., day labor. $60,000. A. Noack, 51 Court St., Hackensack, engr. Owner will purchase materials at later date. Noted May 21.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Queens Blvd., to Ferony & Gillespie, 134 East 177th St., New York, $15,400. Noted Apr. 30.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in East Tremont Ave., to Sareno Contg. Co., 1957 Colden Ave., $11,222. Noted Apr. 30.

O., Akron—F. E. Swineford, dir. P. Serv., 15 m.g. pump for centrifugal turbine type, Kent Water Station, to Dravo-Doyle Pump Co., 4800 Prospect St., Cleveland, $31,500.

O., Columbus—City, W. H. Duffy, dir. Serv., 200,000 gal. steel booster tank with roof, to Chicago Bridge & Iron Wks., Union Trust Bldg., Cleveland, $84,900; two 6 m.g. centrifugal motor driven pumps, switchboard and instruments, piping and valves, to Downing & Hetrick, 12 North 3rd St., $12,630.

Pa., Pittsburgh—City, c/o E. G. Lang, dir. P. Wks., City Hall, superstructure Brilliant Pumping Station, 1 story, basement, subbasement, 71 x 601 ft., sandstone, glazed tile, limestone, inside ceramic glazed tile, incl. valves, chamber, heating, plumbing, at Aspinwall, to Henry Busse Co., 112 Wabash Ave., $111,980. Noted Apr. 30.

Pa., Roaring Springs—Boro, 2,000 ft. 8 in. c.i. mains, own forces and will buy materials. **Maturity this summer.** B. Long, boro engr.

R. I., Barrington—Bristol & Warren Waterworks Co., Barrington, distribution system, to L. H. Callan Constr. Co., Bay View Ave., Bristol. Noted Apr. 9.

Tex., Amarillo—City, waterworks improvement, incl. 12,000 lin.ft. 2 in. galvanized and 10,000 lin.ft. 6 in. c.i. pipe, 24 tees, sixty 6 and 8 in. plugs, ells, sleeves, to Clow & Cowan and Morrison Supply Co., Amarillo, $34,000.

Wash., Aberdeen—City Comrs., repaving 3.8 mi. Wishkah line of municipal water works, wood pipe, to Wright Constr. Co., Aberdeen, $75,613. Est. $75,000. Noted Apr. 2.

Wash., Seattle—Bd. P. Wks., City Hall, 75 m.g. reservoir, riveted steel pipe, to Elliott, Stroud Bros. & Seabrook, 5215 Orcas St., $384,359. Noted Apr. 23.

Ont., Colborne — Village, general contract waterworks, laying mains, etc., to A. Cherico, 89 Front St. E., North Bay; c.i. pipe, fittings, to National Iron Wks., foot of Cherry St., Toronto; steel standpipes, to Toronto Iron Wks., Eastern Ave., Toronto; valves, hydrants, to Canada Valve & Hydrant Co. Ltd., Morell St., Brantford; service materials, to Canada Brass Mfg. Co., 415 Dundas Rd., Galt. Est. $65,000

Ont., Weston—Town, laying 6 and 12 in. c.i. mains, in Maple Ave., Church, Janet, John and King Sts., to Simone Contg. Co., Weston, $10,735. Owner will purchase pipe, valves, etc. Total est. $16,000.

SEWERS

PROPOSED WORK

Calif., Pasadena—City Council compressor at sewage disposal plant. $20,000. G. K. Cooper, city engr.

Calif., San Rafael—City Council 21,696 ft. 6- to 12-in. vitr. and 776 ft. 6 and 8 in. c.i. sewers in Homestead Valley. R. Messner, San Rafael, co. surv.

Conn., Hartford—Metropolitan Dist. Comn., Bureau P. Wks., Main St., soon takes bids sanitary sewers in Princeton, Harvard, Mountain, Forster, Freeman, Abbott, Cumberland, Carmel and Linnmore Sts. $40,000. R. Clark, City Hall, engr.

Conn., Mystic—State appropriated $60,000, sewage disposal plant at Mystic Oral School, Engineer not selected.

Conn., Newtown—State, 1 story, rein.-con. sewage disposal plant at new State Insane Asylum. $25,000 or more. W. P. Crabtree, Sr., 410 Asylum St., Hartford, engr.

Conn., Niantic—State sewage disposal plant at Seaside Sanatorium. $35,000. Engineer not selected.

Mass., Norfolk — Commonwealth of Massachusetts, Boston, filter beds for sewerage disposal system. $75,000. B. F. Snow, 14 Beacon St., Boston, engr.

Mass., Stoughton—Town, extending sewerage system. $100,000 appropriated. B. L. Winslow, Town Hall, engr.

Minn., Fairmont — City, G. Ansteth, clk., sewage disposal plant. $80,000. Project postponed until 1932. C. Foster, 512 Sellwood Bldg., Duluth, engr. Noted Mar. 5.

Mo., St. Louis—Bd. P. Serv., City Hall, preliminary plans vitr. clay sewers in Southwestern Sewer Dist. 7, $1,700; Rock Creek Sewer Dist. 19, $9,600; Baden Sewer Dist. 8, $9,800; Warne Ave. Sewer Dist. 12, $2,350; Baden Sewer Dist. 9, $7,850. W. W. Horner, city engr.

N. J., Elizabeth—Bd. City Comrs., City Hall, preliminary plans storm water sewer in Newark Ave. $25,000. R. Collins, city engr.

Okla., Lawton — State Bd. Affairs, Capitol Bldg., Oklahoma City, appropriated $25,000, sewage disposal plant at Cameron School of Agriculture. H. J. Darcey, Capitol Bldg., Oklahoma City, engr.

Pa., Lancaster — Sewage disposal plant, $1,000,000. J. N. Chester Engineers, Clark Bldg., Pittsburgh, engrs.

R. I., Providence—Sewerage works in College Rd., Longo, Boyd, Sharon and Bradley Sts. $25,000-$30,000.

Ont., Ottawa—For 84- to 90-in. concrete or concrete and brick trunk sewer along Rideau Canal, part open cut and part tunnel construction. $200,000. F. C. Askwith, City Hall, engr.

Ont., Toronto—East York Twp., 8 in. and up vitr. tile sanitary and storm sewers in Bennington Heights Dr. $3,190. Heath St. $17,453. Burnham Rd. $4,898. Moorehill Ave. $24,958. G. R. Jack, 443 Sammon Ave., engr.

Ont., Waterloo—Preparing plans and takes bids about June 15, sewage disposal plant improvements, incl. additional settling beds, 8,100 ft. new mains. $79,000. James, Proctor & Redfern, 1004 Excelsior Life Bldg., Toronto, engrs.

BIDS ASKED

Calif., Glendale—G. E. Chapman, city clk., taking bids 500 ft. 21 in. and 500 ft. 12 in. centrifugal rein.-con. or concrete pressure pipe with collars.

Ill., Westchester—May 25, by Village, sewer and water stubs. $39,800. Consoer, Older & Quinlan, 222 North Wells St., Chicago, engrs.

Kan., McPherson—See "Contracts Awarded."

Kan., Wichita—June 4, at office C. C. Ellis, city clk., Primary Sewage Treatment Plant. Black & Veatch, Mutual Bldg., Kansas City, Mo., engrs.

Mich., Escanaba—June 3, by City, mechanical equipment, incl. pumps, c.i. and vitr. tile pipe for sewage treatment plant; bids about July 7, for general contract. $180,000 bonds voted for same. T. H. Kessler, city mgr. Suhr, Peterson, Berryman & Suhr, 134 North Wells St., Chicago, Ill., engrs.

O., Cleveland — May 27, by City, Walworth Run sewer connection to Brevier Ave., Big Creek intercepting sewer to Bellaire Rd. R. Hoffman, city engr.

Pa., Munhall—See "Streets and Roads."

Wash., Seattle—See "Streets and Roads."

Ont., Brampton—Town, C. M. Corkett, clk., bids about June 1, sewage disposal plant. $95,000. W. M. Treadgold, 13 Woodlawn Ave. E., Toronto, civil engr.

CONTRACTS AWARDED

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., installing pumps in Calumet Sewage Treatment Plant, 125th St. and Cottage Grove Ave., to Allis-Chalmers Co., West Allis, Milwaukee, Wis., $69,500, blowers, to Elliott Co., 20 North Wacker Dr., $136,500; valves, to Chapman Valve Co., 835 West Washington Blvd, $26,929. Grand total, $232,929.

Ill., Woodstock—City Council, general contract sewage treatment plant, to Hanson Bros., 127 North Dearborn St., Chicago, $54,252; sludge conveying mechanism, to Link-Belt Co., Huntington Park Ave. and Nicetown Lane, Phila., Pa., $6,200; heating cover digester, to Pacific Flush Tank Co., 4241 Ravenswood St., Chicago, $4,200; aerators, to Simplex Ejecter Aerator Corp., 2528 West Madison St., Chicago, $14,400. Grand total $79,052. Noted Sept. 4.

Ind., Seymour—City Council, 3rd St. Relief Sewer, to Krenn & Dato, 4216 College Ave., Indianapolis, $62,531. Est. $75,000. Noted Apr. 23.

Kan., McPherson — City Clerk, sewage disposal plant equipment, clarifier, to Link-Belt Co., 910 South Michigan Ave., Chicago, Ill., $2,435; digester, to Harding Co., Phila., Pa., $3,980; sludge pump, to Door Operators Corp., 1217 West Monroe St., Chicago, Ill., $620. Grand total $7,035. Bids about June 2, constructing sewage disposal plant. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Western Ave., etc., Brighton, to J. Loconzola, Jr. & N. DiBartolemeo, East Boston. Est. $25,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Centre St., West Roxbury, to V. J. Grande, 100 Academy Hill Rd., Brighton, $20,033. Est. $25,000.

Mass., Boston—Dpt. P. Wks., sewerage works in Westglow St., Dorchester, to J. F. Kennedy, Chamber of Commerce Bldg., $18,279. Est. $25,000. Noted Apr. 23.

N. J., Paterson—Bd. P. Wks., City Hall, storm sewer in Lenox and Lexington Aves., to J. Susino, 115 Pine St., Paterson. Est., $25,000.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro., Boro Hall, sewers in Kenmore Pl. and East 27th St., to Alvon Contg. Co., 2771 Nostrand Ave., $5,965 and $4,346 respectively; East 88th St. and Farragut Rd., to F. Vacaro, 1260 60th St., $1,717 and $905 respectively. Grand total $12,933. Noted Apr. 16.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Schenectady Ave., to P. Tomasetti Contg. Co., 1074 60th St., $324,366; Coyle St., to Coprib Contg. Co., 1215 82nd St., $5,529; East 93rd St., to F. Meluccio, 1209 61st St., $1,815. Grand total $349,710. Noted Apr. 9.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, storm sewers in Avenues R and S, to Delhan Constr. Co., 1325 54th St., $209,658; in East 26th St., to J. J. LoSchiabo, 2315 Avenue U, $6,467. Noted Apr. 2.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Boro Hall, to E. Meluccio, 1209 61st St., Brooklyn, sewers in 71st Ave. $2,504; to M. Fornara, 216 1st Ave., Brooklyn, 91st St. $6,958, Hollis Ave. $9,945, 189th St. $16,186; to Logran Contg. Co., 2301 Beverly Rd., Brooklyn, 39th Ave. $60,524, 243rd St. $14,254; to Marmoth Constr. Co., 94-14 107th Ave., Jamaica, 108th Ave. $1,059, 145th St. $4,576, 174th St. $6,024, 146th St. $2,705; to Belfatto Constr. Co., Foch Blvd., South Ozone Park, 148th St. $3,998; to Flushing Contg. & Eng. Co., 66 Wyoming Ave., Forest Hills, Liberty Ave. $6,809, Newberg St. $8,449. Grand total $143,171.

N. Y., New Rochelle—Dpt. P. Wks., sewers in Paine Ave. and Wykagyl Terrace, to H. J. Miele, Milburn Terrace, Maplewood, N. J.

O., Akron—F. E. Swineford, dir. P. Serv., Southern Outfall Sewer, 3,200 ft. 36 and 48 in. vitr. clay, brick or segmental block trunk sewer, to Shullo Constr. Co., 1200 Home Ave., $32,755. Est. $90,000. Noted Apr. 30.

Pa., Etna—J. C. Armstrong, boro secy., 15,500 lin.ft. 6- to 36-in. trunk sewers, concrete, brick manholes from Allegheny River along Pine Creek northerly line of Shaler Twp., to F. George, 2503 Grant Bldg., Pittsburgh, $121,768. Est. $100,000. Noted Apr. 9.

Tex., Dumas—City, M. A. Turner, city clk., 57,270 ft. 6, 8, 10 and 12 in. vitr. clay sewerage system, to Panhandle Constr. Co., Lubbock, $30,701. Noted Apr. 30.

Tex., Eagle Pass—Central Power & Light Co., c/o Natl. Bank Commerce Bldg., and Alamo Bank Bldg., San Antonio, three 4,000 kw. umbrella type vertical water wheel generators for hydro-electric plant (now under construction), near here, to Westinghouse Electric & Mfg. Co., 150 Bway., New York. Est. $125,000. Noted Feb. 18.

Ont., Westboro—Nepean Twp., constructing sewage disposal system, Sects. G. and F., to Ryan Constr. Co. Ltd., 30 Sandwich St., East Windsor, $17,402 and $31,544 respectively; pumphouse, to Grant Bros. Constr. Co., 354 Bank St., $17,644; pumps, to Smart-Turner Machine Co., 191 Barton St. E., Hamilton, $2,683. Grand total $69,273.

Que., Montreal—Trunk sewer in Kelly St., to Henault & Heffernan, Montreal, $195,300; in St. James St., to Eastern Constr. Co. Ltd., Montreal, $199,220.

WASTE DISPOSAL

PROPOSED WORK

N. J., Irvington (br. Newark) — Town Council, Town Hall, bids in June, incinerator addition, Colt St. $160,000. I. Casey, Jr., town engr. Noted Apr. 30.

BRIDGES

PROPOSED WORK

La., New Orleans—Public Belt R.R. Comn., Municipal Bldg., railroad and hy. bridge over Mississippi River, near here. Project indefinitely in abeyance. Noted May 14.

Mass., Everett — Commonwealth of Massachusetts, Metropolitan Dist. Comn., preliminary plans widening concrete, steel bridge, Revere Beach Parkway. $25,000 or more.

Missouri—State Hy. Bd., Jefferson City, rein.-con., steel viaduct to carry Hy. 71 over St. Louis-San Francisco Ry., near Crocker, $19,000; rein.-con., steel viaduct, approaches to carry Hy. 4, over Milwaukee, St. Paul & Pacific R.R., near Lucerne, $30,967. Railroads to share cost.

Mo., St. Louis—Chicago, Burlington & Quincy R.R. Co., A. W. Newton, ch. engr., 547 West Jackson Blvd., Chicago, Ill., new bridge over Maline Creek drainage project. $89,116. Cost to be borne equally by City and Railroad.

N. J., Hughesville—Joint Bd. Freeholders Warren Co. (Belvidere) and Hunterdon Co. (Flemington) at Court House, Belvidere, rein.-con., steel bridge over Musconetcong River, $25,000. W. Vetter, Court House, Belvidere, engr. Warren Co.

N. J., New Brunswick—Bd. Freeholders Middlesex Co., Court House, steel, concrete bridge over Farrington Lake and Oakleys Brook, Fresh Pond to Georges Rd. $25,000. **Maturity probably soon.** F. Buchanan, Court House, co. engr.

N. Y., New York—Dpt. Plant & Structures, Municipal Bldg., sketches suspension bridge over Harlem Ship Canal at Spuyten Duyvil, $10,000,000. **Maturity indefinite.** Noted Mar. 28, 1929.

Constr. News page 215A

Bridges (Continued)

N. Y., Shelter Island and Brook Haven—Suffolk Co., Riverhead, bids after May 20, substructure bridges connecting Shelter Island with mainland, on north and south sides of Island; bridge, approaches from mainland to Ocean Beach, at Smith's Point, Brookhaven, $3,350,000. Robinson & Steinman, 117 Liberty Sts., New York, engrs. Noted Apr. 23.

Okla., Gate—State Hy. Dpt., Oklahoma City, preliminary plans 7 span 112 ft. concrete, rein.-con. trestle, Beaver Co. $25,000. A. R. Losh, hy. engr.

Pa., Pittsburgh—City, E. G. Lang, dir. P. Wks., City Hall, replacing Herrs Island Back Channel Bridge. $205,000. C. M. Reppert, City-County Bldg., engr.

Tex., Houston—City, c/o W. E. Monteith, mayor, rein.-con. bridge over Brays Bayou, on 75th St. $45,000. J. M. Nagle, city engr.

BIDS ASKED

California — June 3, by State Hy. Comn., Sacramento, four 40 ft. span rein.-con. girder bridge over San Marcos Creek, also grading, concrete paving approaches, 7 mi. north of Paso Robles, San Luis Obispo Co. C. H. Purcell, P. Wks. Bldg., Sacramento, hy. engr.

Calif., Montalvo—May 27, by C. H. Purcell, engr. State Hy. Comn., Sacramento, twenty-one 86 ft. span deck plate girder bridge, concrete piers, abutments over Santa Clara River, 1 mi. from here, Ventura Co.

Illinois—May 29, by State Dpt. P. Wks. & Buildings, Div. Hys. Springfield, seven 60 ft. span rein.-con. girder bridge, Route 9, Sect. 48-B, Dist. 4, Peoria Co.—75 ft. steel superstructure on rein.-con. substructure, Route 46, Sects. 4621-B and C, Dist. 1, incl. 191,450 lb. structural steel—one 64 ft., twenty-three 95 ft. and six 83 ft. span steel superstructure on rein.-con. substructure, Route 46, Sects. 462-B and C, Dist. 1, incl. 8,160,000 lb. structural steel, both Cook Co.—five 75 ft. span rein.-con. arch bridge, one 24 ft. span rein.-con. slab bridge, one 16 ft. span and two 8 ft. span rein.-con. culverts, Route 69, Sect 125-B, Dist. 3, La Salle Co.—one 16 ft. span rein.-con. slab bridge, two 20 ft. and one 20 ft. span rein.-con. girder bridges, Route 69, Sect. 126-B, Dist. 3, Kendall Co.—six 50 ft. span rein.-con. girder bridge, rein.-con. substructure, two rein.-con. girder approach spans, Route 129, Sect. 107-B—125 ft. steel superstructure, Route 129, Sect. 107-C, both Dist. 7, Effingham Co.—three 35 ft. span rein.-con. girder bridge, two steel I-beam bridges each to have three 40 ft. spans on concrete piles, incl. 320,000 lb. reinforcing steel, Route 157, Sect. 117-B, Madison Co. F. T. Sheets, hy. engr. State furnishes cement.

Indiana — May 26, by State Hy. Comn., Indianapolis, 36 ft. span rein.-con. girder bridge, 24 ft. roadway, over Crooked Creek near Royal Center, Cass Co.—60 ft. steel truss bridge, 24 ft. roadway, over Big Indian Creek, near Thornhope—40 ft. steel truss bridge, 24 ft. roadway, over Mill Ditch, near Winamac—one 124 ft. and one 175 ft. span steel truss bridge, 22 ft. roadway, over Tippecanoe River, near Winamac, all Pulaski Co.—60 ft. rein.-con. arch bridge, 24 ft. roadway over Williams Creek, 150 ft. steel truss bridge, 22 ft. roadway over Little Raccoon Creek—30 ft. rein.-con. arch underfill, 36 ft. roadway over Millers Branch, all near Rockwell, Parke Co.—two 24 ft. span rein.-con. girder bridge, 24 ft. roadway over Dooly Creek—three 84 ft. span steel truss bridge, 24 ft. roadway over Big Raccoon Creek, both near Hollandsburg, Parke Co. — 40 ft. rein.-con. arch bridge, 24 ft. roadway over Moccasin Branch near Morton — 36 ft. rein.-con. arch bridge, 28 ft. roadway over Drainage Ditch near Greencastle, both Putnam Co. — 40 ft. rein.-con. girder spans, one 106 ft. steel girder span bridge over Pennsylvania R.R. near Wanatah, 24 ft. roadway, incl. grading 0.3 mi. approaches — 28 ft. rein.-con. girder bridge, 24 ft. roadway over Norris Drain, near Michigan City, both Laporte Co.—36 ft. rein.-con. girder bridge, 24 ft. roadway over Purdy Marsh, near Bicknell, Knox Co. J. J. Brown, dir.

Iowa—May 26, by State Hy. Comn., Ames, one 24 x 24 ft., one 36 x 24 ft. and three 44 x 24 ft. I-beam bridges, one 90 x 20 ft. pony truss bridge with two 28 x 28 ft. I-beam approach spans, Primary Rd. 99, B-698, Jackson Co.—160 x 20 ft. high truss span with six 50 x 20 ft. I-beam approaches over Big Sioux River, U. S. Rd. 18, B-229, Lyon Co.—18 culverts, Primary Rd. 220, B-755, Iowa Co.—two 42 x 24 ft. and one 45 x 24 ft. span I-beam bridge over Minneapolis & St. Louis R.R., also grading, paving approaches, U. S. Rd. 30, X-505, Marshall Co. C. R. Jones, aud.

Kansas—See "Streets and Roads."

Mo., St. Louis—See "Contracts Awarded."

Missouri—May 29, by State Hy. Bd., Jefferson City, bridges in Bollinger, Callaway, Clark, Dallas, Daviess, Laclede, Lafayette, Madison, Pemiscot, Pike, Randolph, St. Clair, St. Francois, St. Louis, Scotland, Stoddard, Texas, Vernon, Washington and Wright Counties. T. H. Cutler, state hy. engr.

N. J., Teaneck—June 1, by State Hy. Comn., Trenton, bridge to carry Route 4, Sect. 3 over Teaneck Rd., Bergen Co. A. L. Grover, ch. engr.; adv. E. N.-R. May 21.

Pa., Ligonier — May 29, by Bd. Supervs. Ligonier Twp., A. K. McDowell, secy., Court House, Greensburg, two 30 ft. span concrete bridge, 24 ft. roadway over Mill Creek.

Tex., Harlingen—Cameron Co. c/o C. F. C. Ladd, Harlingen, taking bids concrete, steel vehicular bridge over Arroyo Colorado. $75,000.

Constr. News page 216

Address C. F. G. Ladd, Harlingen or A. Tamm, engr., Harlingen.

Wash., Colfax—June 2, by S. J. Humes, dir. Hys., Olympia, three 60 ft. span rein.-con. bridge over Palouse River, on State Rd. 3, Whitman Co.

West Virginia—See "Railways."

Wisconsin and Michigan—June 4, by Wisconsin State Hy. Comn., and Michigan State Hy. Dpt. (Lansing), at Court House, Florence, Brule River Bridge, Florence Co. Wis. and Iron Co. Mich.

Wis., LaCrosse—May 26, by State Hy. Comn., Court House, Lagoon and Gunderson Bridges, U. S. Hy. 61, S.A.P. 5269, LaCrosse Co.

Ont., Huntsville—May 29, by C. H. Fullerton, deputy minister Dpt. Northern Development, Parliament Bldgs., Toronto, one 40 ft. beam and two 25 ft. beam span rein.-con. hy. bridges, on Ferguson hy., in Parry Sound Dist. $25,000. J. Sinton, Parliament Bldgs., Toronto, ch. engr.

CONTRACTS AWARDED

Alabama and Mississippi—L. G. Smith, hy. dir., Montgomery, Ala., and C. Williams, dir. hys., Jackson, Miss., 1,400 lin.ft. treated piling, concrete, steel bridge over Escatawpa River, in Mobile Co., Ala., and George Co., Miss., to Walton & Cunningham, Union, Miss., $53,641. Noted Apr. 2.

California — State Hy. Comn., Sacramento, rein.-con. girder bridge over Coon Creek, near Lincoln, Placer Co., to Ulrich Constr. Co., Modesto, $18,973; rein.-con. girder bridge over San Dieguito River, near Del Mar, San Diego Co., to D. Johns, Santa Monica, $138,678. Noted Apr. 9.

California — State Hy. Comn., Sacramento, bridge incl. 290 ft. through steel truss, two 60 ft. and four 50 ft. 6 in. rein.-con. girder spans on concrete piers, concrete bents, abutments, over south fork Eel River, at Dyerville, Humboldt Co., to Smith Bros. Co., Eureka, $106,180—bridge, incl. two 50 ft. steel stringer spans on concrete piers over Clear Creek, south of Redding, Shasta Co., to J. P. Brennan, Redding, $40,161—bridge, incl. 32½ ft. rein.-con. girder spans on concrete abutments with wing walls over Browns Creek, Trinity Co., to Whited & Whited, Santa Rosa, $7,924. Grand total $163,265.

Calif., Redwood City—City Council, rein.-con. bridge over Redwood Creek, paving Main St., to W. O. Tyson, 52 Jefferson St., $25,000. Noted Oct. 23.

Calif., Visalia—G. Stewart, clk. Tulare Co., constructing Bridge 90 over St. Johns River, at Dinuba Blvd., to Pacific Properties & Constr. Co., 3747 Woodruff Ave., Oakland, $12,975. Materials, amounting to $12,585, to be furnished by owner. Noted Apr. 16.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, bridges in Cumberland Co., to Casey Constr. Co., Casey, $31,178—Route 151, Sect. 115-B, Jackson Co., to R. H. King, Danville, Ind., $25,970—Route 151, Sect. 115-C, Jackson Co., to International Steel & Iron Co., 1321 Edgar St., Evansville, Ind., $22,421 — Route 95, Sect. 120-B, McDonough Co., to H. C. Holmes, Macomb, $8,915 — Route 95, Sect. 120-C, McDonough Co., and Route 82, Sect. 129-C, Henry Co., to Vincennes Bridge Co., Vincennes, Ind., $8,572 and $11,496 respectively—Route 82, Sect. 129-C, Henry Co., to Clinton Eng. Co., Clinton, Ia., $29,875—Route 120, Sect. 102-B and C, Logan Co., to Illinois Steel Bridge Co., Jacksonville, $22,307 and $7,614 respectively. Grand total $168,346. Noted Apr. 9.

Ill., Chicago — City, City Hall, operators' houses and enclosure walls for double leaf trunnion bascule bridge over Chicago River at North Clark St., to M. J. Boyle, 105 West Monroe St., $61,400.

Ill., Chicago — City, City Hall, temporary approaches and single span, swing bridge to detour South Halsted Street over South Branch Chicago River, to J. C. Paskin & Co., 208 South La Salle St., $145,468. Noted Mar. 19.

Indiana—State Hy. Comn., Indianapolis, 1 span 65 ft., rein.-con. arch bridge, Porter Co., to H. Thorpe, Fountain City, $31,523 est. $40,157: 1 span 52½ ft. rein.-con. girder bridge, Porter Co., to E. F. Smith, 2050 South Harding St., Indianapolis, $14,499 est. $18,673. Noted Apr. 9.

Ia., Sac City—Sac Co., one 80 x 20 ft. pony truss bridge with two 32 x 20 ft. I-beam approach spans, one 60 x 20 pony truss bridge, also 10,000 cu.yd. grading roads, to Eno & Montgomery, Rockwell City, $21,838. Noted Apr. 16.

Kentucky—See "Streets and Roads."

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, extending 2 bridges, Contr. P-173-311: Prince Georges Co., to Fredericksburg Bridge Co., Fredericksburg, Va., $24,557; extending 2 bridges, Contr. P-172-311, Prince Georges Co., to Consolidated Eng. Co., 20 East Franklin St., Baltimore, $29,294. Noted Apr. 30.

Minn., Red Wing—State Hy. Dpt., St. Paul, Bridge 4995, 320 ft. long, State Project 3-60-3, near here, to A. Guthrie & Co., Builders Exch. Bldg., St. Paul, $34,950.

Missouri—State Hy. Bd., Jefferson City, to Service Constr. Co., Poplar Bluff, bridges over Saline Creek, Madison Co. $16,359—to Kufuel & Gule, Perryville, over Indian Creek, Perry Co. $8,915—to H. H. Ruddell, Springfield, over Spring Creek $8,063; over Norris Branch $3,872, both Dent Co.—to Pioneer Constr. Co., 270 Glover Bldg., Kansas City, over Weldon Overflow, Sta. 650-28 $70,566; over Weldon Overflow, Sta. 643-28 $10,384; over Weldon Overflow, Sta. 657-28 $7,946; over fork Grand River $21,562; over Weldon Fork Overflow, Sta. 663-00 $3,126, all foregoing Mercer Co.—to Dent Tanner, Charleston, over branch $1,088; over branch $774, both Wayne Co.—to M. E. Gillioz, Monett, over Hominy Creek $10,654; over branch Hominy Creek $1,849; over branch $655, all foregoing Polk Co.—to C. N. Lund, 815a Chestnut St., St. Louis, over Sandy Creek $3,274; over Dunlin Creek $9,386; over creek $953; over Skullbone Creek $14,597; over Big River, $41,411, all foregoing Jefferson Co. — to M. Wunderlich, Snell Ave., St. Paul, Minn. over Gray's Creek $8,634; over Kauffman's Branch $5,435; over Strobel Branch $2,877, all foregoing Cole Co.—to M. Haase, St. Joseph, over West Muddy Creek $6,313; over stream $2,763; over Sandy Creek $8,924; over Thompson Fork Overflow $8,695; over Martin Creek $3,445. Grand total $282,520. Noted Apr. 23.

Mo., St. Louis—Chicago, Burlington & Quincy R.R. Co., A. W. Newton, ch. engr., 547 West Jackson Blvd., Chicago, Ill., new and enlarged span for rein.-con. steel bridge over Riverview Dr. at Prospect Hill, North St. Louis, own forces. $101,000. Cost to be borne equally by City and Railroad.

Mo., Webster Groves—Missouri Pacific R.R. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., St. Louis, and St. Louis Co., Clayton, substructure double track concrete, steel bridge over Lockwood Ave., to Winston Bros. Co., Buder Bldg., St. Louis; 500 tons structural steel, to McClintic Marshall, 1010 Pine St., St. Louis, Mo., and Oliver Bldg., Pittsburgh, Pa. Est. $70,000. Noted July 24.

New Jersey—State Hy. Comn., Trenton, steel, concrete viaduct, Bergen Co., to J. Beradino, 118 Liberty St., Boonton, $140,546. Noted Apr. 23.

New Jersey—State Hy. Comn., Trenton, viaduct to carry route 4, Sect. 3 across Dean St., Northern R.R. of New Jersey and Hasse Pl., Englewood, Bergen Co., to F. F. Baker, Montclair, $208,733. Noted Apr. 23.

New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, reconstructing Purdy's Bridge, in Croton Water Shed, to Flood Eng. Co., 186 Remsen St., Brooklyn, $16,767. Noted Apr. 20.

New York—A. W. Brandt, comr. Hys., Albany, bridges in Delaware Co., to H. Hull, Highland Falls, $17,082 est. $24,305; in Essex and Clinton Counties, to Albany Bridge Constr. Co., Inc., 518 Bway., Albany, $29,834 est. $37,745. Noted May 6 Daily.

N. Y., Yonkers — Westchester Co., Court House, White Plains, bridge over Tibbetts Brook, on McLean Ave., to J. J. Farley, Croton-on-Hudson, $268,056. Noted Apr. 9.

Ohio — O. W. Merrell, dir. hys., Columbus, two 24 ft. span concrete slab bridge over Bates Creek, 24 ft. roadway, Geauga Co., and three 24 ft. span concrete slab bridge over Eagle Creek, 24 ft. roadway, Portage Co., to Bish & Carey, Ada, $10,424 and $10,834 respectively—grade separation under New York Central R.R., Pennsylvania R.R. and Clinton, Davenport & Muscatine R.R. tracks, Franklin Co., to Adkins-Davis Constr. Co., 99 East Tomkins St., Columbus, $32,055—steel truss bridge over Scioto Brush Creek, 24 ft. roadway, with U abutments, approach slab, Scioto Co., to Dodge-Hussey, Inc., 1174 West 5th Ave., Columbus, $40,744—one 80 ft. and two 32 ft. span deck cantilever steel girder bridge over Salt Run, Jefferson Co., to N. A. Tonti, 247 South 7th St., Steubenville, $41,139—one 75 ft. and two 57 ft. span steel beam bridge over Salt Creek, 24 ft. roadway, sidewalks, brick approaches, Ross Co., to W. P. Townsend, Greenville, $48,775. Grand total $183,971. Noted Apr. 16.

O., Cleveland—Cleveland Union Terminals Co., Terminal Tower, 160 ft. rein.-con. bridge, 66 ft., Chatham and Lorain Aves., to Industrial Constr. Co., 308 Euclid Ave.

Okla., Sulphur—State Hy. Dpt., Oklahoma City, 9 span 132 ft. rein.-con. bridge, Murray Co., to W. L. James, Hugo, $28,183. Est. $33,000.

Pa., Pittsburgh—City, E. G. Lang, dir. Bd. P. Wks., City-County Bldg., one 209 ft., one 96 ft. span bridge, 22 ft. roadway, two 9 ft. sidewalks over Pennsylvania R.R., at 28th St., incl. 563,000 lb. trusses, 26,400 lb. roller nests, 119,500 lb. floor system, 8,300 lb. expansion dam, 34,300 lb. fascia beams, and demolition, contr. to Amer. Bridge Co., Frick Bldg., $49,490. Est. $150,000.

Texas—State Hy. Comn., W. R. Ely, chn., Austin, steel I-beam stringer bridge over Red River between Vernon, Tex. and Elmore, Okla. to W. S. Crawford, Dallas, $122,501. Noted May 7 under "Elmore, Okla."

STREETS AND ROADS

BIDS ASKED

California—May 27, by C. H. Purcell, engr. State Hy. Comn., Sacramento, heavy fuel oil and cut back asphalt as dust palliative on 60.1 mi. road betwen Redding and Fall River, Shasta Co.—bituminous treated rock borders on 19.2 mi. Yuba City-Biggs Rd., Yuba and Sutter Counties—grading 7.1 mi., concrete paving 4.9 mi. Turner Station-Stockton Rd., San Joaquin Co.—asphaltic concrete widening 21 mi. existing pavement between East High Lane Canal and Sand Hills, Imperial Co.—undergrade crossing, incl. 2 concrete abutments with wing walls, under tracks Southern Pacific R.R., near Henderson Station, also drainage system, pumping equipment, grading, paving 0.4 mi. roadway, San Mateo Co.

California — June 3, by State Hy. Comn., Sacramento, grading, bituminous treated crushed gravel or stone surfacing 12.3 mi. road between Yerbys and Casa Diablo Hot Springs, Mono Co.—4.7 mi. road between point 3.2 north of Hollister and Pascheco Pass Rd., San Benito and Santa Clara Counties—surface treat-

Streets and Roads (Continued)

ing 15.5 mi. road between Murphys and Big Trees, Calaveras Co.— grading, asphaltic concrete surfacing 2.2 mi. through Upland, San Bernardino Co.— applying to existing roadbed bituminous surface treatment on 7 mi. road between point 1.5 mi. north of Yreka and Klamath River, Siskiyou Co. C. H. Purcell, hy. engr.

Calif., Inglewood—City Council taking bids curbing, sidewalks, grading 200,000 sq.ft. Ash St., et al. W. Peffer, city engr.

Calif., Nevada City — Bd. Supervs. Nevada Co. bids about June 1, improving 10 mi. road between Grass Valley and Colfax Ave., incl. 35,000 cu.yd. roadway excav., 6,000 cu.yd. crusher run base, 3,558 tons broken stone (bituminous macadam surfacing), 289 tons emulsified asphalt.

Calif., San Jose—H. Pfister, clk. Santa Clara Co., soon takes bids 5 in. asphaltic concrete surfacing 121,975 sq.ft. Alviso-Milpitas Rd. R. Chandler, San Jose, co. surv.

Calif., Santa Barbara—City Council taking new bids curbing, guttering, sidewalks, 8-5-8-in. concrete paving 150,000 sq.ft. East Canon Perdido St. Former bids rejected.

Ind., Bloomington—June 2, by Bd. Comrs. Monroe Co., crushed stone surfacing 13,700 ft. Sam McCoy Rd., $23,453; 6,764 ft. Jacob Keller Rd., $10,525. A. Eller, Bloomington, aud.

Ind., Evansville — June 1, by Bd. Comrs. Vanderburgh Co., improving North Willow Rd. $28,287. E. D. Koenemann, Evansville, aud.

Ind., Plymouth — June 2, by Bd. Comrs. Marshall Co., concrete surfacing M. Stickle and A. B. Cummins Rds. $29,990. O. H. Weber, Plymouth, aud.

Ind., Salem—June 1, by Bd. Comrs. Washington Co., concrete surfacing Lichskillet, Old State and Livonia Rds. $29,977. W. J. Nicholson, Salem, aud.

Ind., South Bend—May 25, by Bd. Comrs. St. Joseph Co., concrete surfacing Turkey Creek County Unit Rd., $75,000; Ice County Unit Rd., $110,000. F. P. Crowe, South Bend, co. aud.

Ind., Terre Haute—May 28, by Bd. Comrs. Vigo Co., brick surfacing C. N. Smith Rd. $11,705, concrete surfacing R. G. Weber Rd. $16,234; May 22, gravel surfacing William Shommer Rd., Honey Creek Twp., $16,094. C. C. Pinson, Terre Haute, aud.

Ind., Wabash—June 2, by Bd. Comrs. Wabash Co., concrete surfacing Arnold Schuler Rd., $30,-150; Alvah Lines Rd., $15,080. Q. A. Carver, Wabash, co. aud.

Iowa—May 26, by State Hy. Comn., Ames, grading, drainage structures, paving 0.27 mi. U. S. Rd. 34, P-550, Lucas Co.—0.91 mi. Primary Rd. 15 and 105, P-752-E and F, Winnebago Co.—0.892 mi. U. S. Rd. 61, F-306, Des Moines Co. — 9.44 mi. Primary Rd. 3, P-136, Fremont Co.—gravel surfacing 1.31 mi. Primary Rd. 92, from Urbana West, P-471—9.16 mi. Primary Rd. 101 northeast of Vinton, F-263; both Benton Co.—27.449 mi. Primary Rd. 117, from Maquoketa to Sabula, P-532—8.4 mi. Primary Rd. 62, from Maquoketa through Andrew, P-533—10 mi. Primary Rd. 62, from Bellevue to Andrew, F-144, all Jackson Co. — 9.389 mi. Primary Rd. 146 from Grinnell south, P-514, Poweshiek Co.—10.822 mi. Primary Rd. 130, P-566, Winneshiek Co.—1.9 mi. Primary Rd. 2, from Knoxville, F-7, Marion Co.—U. S. Rd. 18, P-604, O'Brien Co. —1.31 mi. Primary Rd. 92, from Urbana west, B-471, Benton Co. — 288 cu.yd. stone riprap F-257—419 cu.yd. stone riprap, F-303, both Tama Co. C. R. Jones, aud.

Ia., Forest City—May 25, at office Auditor Winnebago Co., grading drainage structures 8.113 mi. roads. G. S. Jones, Forest City, co. engr.

Ia., Newton—May 27, at office Auditor Jasper Co., gravel surfacing and maintenance work 10 mi. roads. R. McMurray, Newton, co. engr.

Kansas—May 26, by State Hy. Comn., Court House, Marysville **(P. means Project K.P. Kansas Project and F.A.P. Federal Aid Project)**, grading, drainage structures, culverts, concrete surfacing 0.133 mi. P. 73-35, F. A. P. 265-D, Brown Co.—8.711 mi. P. 9-22, F. A. P. 435-A, incl. three 35 ft. deck girder and one 8 ft. multiple box spans—bituminous blotter treatment re-surfacing 9.447 mi. P. 36-27, K. P. 7370—5.504 mi. P. 36-26, K. P. 7371, all Marshall Co.—grading, drainage structures 2.293 mi. P. 32-3, F. A. P. 321-D, incl. three 40 ft. deck girder spans, P. 32-3, F. A. P. 321-D—cleaning, painting bridge, P. 32-3, K. P. 7372—bituminous drag treating 0.9 mi. P. 5-1, K. P. 7381—0.8 mi. P. 73-E-24, K. P. 7382, all Wyandotte Co.—2.5 mi. P. 50-47, 48 and 49, K. P. 7374—bituminous retread re-surfacing 0.3 mi. P. 7-20, F. A. P. 7373—bituminous blotter treating 0.2 mi. P. 73E-20, K. P. 7376—bituminous drag treating 1.9 mi. P. 50-46, K. P. 7377—3.45 mi. P. 58-1, K. P. 7378—0.5 mi. P. 10-16, K. P. 7379, all Johnson Co.—bituminous drag and blotter treating 3.65 mi. P. 4-31, K. P. 7378, Atchison Co.—0.45 mi. P. 50S-43, K. P. 7375 Douglas Co. W. V. Buck, Topeka, hy. engr.

Kansas—May 28, by State Hy. Comn., Court House, St. John **(P. means Project, K. P. Kansas Project and F. A. P. Federal Aid Project)** bituminous blotter treating 4.319 mi. P.166-2, F. A. P. 386-A—1.2 mi. P.166-2, K. P. 1167, both Cowley Co.—5.606 mi. P.54-18, F. A. P. 341-A—8.938 mi. P.54-18 and 19, F. A. P. 341-G, both Pratt Co.—10 mi. P.50S-13, K. P. 7390—3.5 mi. P.50S-14, K. P. 7391, 9.5 mi. P.50S-15, K. P. 7412, all Edwards Co.—3 mi. P.50S-15, K. P. 7489 — bituminous surface mix treating 5.359 mi. P.50S-16, F. A. P. 302-C — 3.048 mi. P.50S-16, F. A. P. 302-E—7.328 mi. P.50S-15, F. A. P. 302-I—5.76 mi. P.50S-15, F. A. P. 302-J, all Stafford Co.—sand gravel or chats surfacing 5 mi. P.8-12, K. P. 7392—6 mi. P.50N-13, K. P. 7393—7 mi. P.96-13, K. P. 7394, all Barton Co.—5 mi. P.13-1, K. P. 7395—16 mi. P.54-29, K. P. 7396, both Butler Co.—5.5 mi. P.1-1, K. P. 7397, Comanche Co.—12 mi. P.15-1, K. P. 7398, Cowley Co.—10.5 mi. P.81-9, K. P. 7399—3 mi. P.50S-24, K. P. 7400, both Harvey Co.—2 mi. P.54-15, K. P. 7401, Kiowa Co.—6 mi. P.14-5, K. P. 7402, Kingman Co.—3 mi. P.1-8, K. P. 7403—9 mi. P.50N-9, K. P. 7404—5 mi. P.50N-10, K. P. 7405, all Pawnee Co.—17 mi. P. 96-12B, K. P. 7406, Rush Co.—4 mi. P.15-8, K. P. 7404—26 mi. P.42-7, K. P. 7408—1 mi. P.49-6, K. P. 7409—5 mi. P.96-21, K. P. 7410, all Sedgwick Co.—14 mi. P.166-1, K. P. 7411, Sumner Co. —grading, culverts, concrete surfacing 1.489 mi. P.17-2, F. A. P. 396-A, incl. three 8 ft. multiple box spans, Reno Co.—three 45 ft. span deck girder bridge, P.81-6, F. A. P. 24-A, Sedgwick Co. W. V. Buck, Topeka, hy. engr.

Kentucky—May 26, by State Hy. Dpt., Frankfort, **(S.A.P. means State Aid Project)**, bituminous surface treating Group 1, 0.509 mi. Eminence Rd., S.A.P. 46-C-1, Henry Co.—3.35 mi. LaGrange-Russells Corner Rd., S.A.P. 19-A—1 mi. LaGrange-New Castle Rd., S.A.P. 19-B-1—2.318 mi. same road, S.A.P. 19-B—0.596 mi. Crestwood-Heads Gate Rd., S.P. 158-A, all Oldham Co.—4 mi. Owentown-Gratz Rd., S.A.P. 19-D—18 mi. Owenton-Georgetown Rd., S.A.P. 49-B, both Owen Co. — Group 2, 2.658 mi. Shelbyville-Taylorsville Rd., S.A.P. 46-F, Spencer Co.—3.7 mi. same road, S.A.P. 46-E—12 mi. Shelbyville-Mt. Eden Rd., S.A.P. 20-A—5.765 mi. Shelbyville-LaGrange Rd., S.A.P. 59-B—8.807 mi. Shelbyville-Cropper Rd., S.A.P. 160-A, all Shelby Co.—Group 3, 5.5 mi. Springfield-Harrodsburg Rd., S.A.P. 47-C, Washington Co.—6.5 mi. Lebanon-Danville Rd., S.A.P. 25-B, Marion Co.—7.117 mi. Danville-Lebanon Rd., S.A.P. 25-C — 4.517 mi. Perryville-Springfield Rd., S.A.P. 47-W, both Boyle Co.—2.843 mi. Danville-Liberty Rd., S.A.P. 96-D, Lincoln Co.—Group 4, 3.2 mi. Lancaster-Nicholasville Rd., S.A.P. 97-A—4.8 mi. Buena Vista Rd., S.A.P. 23-P, both Garrard Co.—5.12 mi. Stanford-Lancaster Rd., S.A.P. 23-F, Lincoln Co.—7 mi. Harrodsburg-Lexington Rd., S.A.P. 47-E—5.319 mi. Harrodsburg-Lawrenceburg Rd., S.A.P. 22-B, both Mercer Co.—Group 5, 0.75 mi. Walton-Nicholasville Rd., S.A.P. 104-B-1, Boone Co. —0.88 mi. Williamstown-Falmouth Rd., S.A.P. 57-A, Grant Co.—4.5 mi. Claryville-Grants Lick Rd., S.A.P. 21-B, Campbell Co.—Group 6, 5.965 mi. Cynthiana-Williamstown Rd., S.A.P. 22-A—6 mi. Cynthiana-Falmouth Rd., S.A.P. 21-C, both Harrison Co.—6.163 mi. Cynthiana-Carlisle Rd., S.A.P. 58½-B, Nicholas Co.—Group 7, 3.2 mi. Owingsville-Carlisle Rd., S.A.P. 61-C, Bath Co. — 0.75 mi. Flemingsburg-Hillsboro Rd., S.A.P. 33-B—6.009 mi. Lexington-Marysville Rd., S.A.P. 20-0K, both Fleming Co.—4.527 mi. Paris-Maysville Rd., S.A.P. 20-J, Nicholas Co. —Group 8, 2.501 mi. Middlesboro-Manring Rd., S.A.P. 5-T — 0.34 mi. Pineville-Walsend Rd., S.A.P. 5-S-2—1.136 mi. Middlesboro-Tennesse State Line Rd., S.A.P. 38-A, all Bell Co.—9.334 mi. London-Livingston Rd., S.A.P. 5-N-1, Laurel Co.—4 mi. Vernon-Livingston Rd., S.A.P. 5-M, Rockcastle Co.—4 mi. Williamsburg-Corbin Rd., S.A.P. 35-A, Whitley Co.—Group 9, 2.8 mi. Ashland-Greenup Rd., S.A.P. 20-R—6.156 mi. Ashland-Greenup Rd., S.A.P. 20, both Greenup Co.—6.96 mi. Cattlesburg-Louisa Rd., S.A.P. 6-B-1—9,306 mi. Ashland-Grayson Rd., S.A.P. 47-S-1, both Boyd Co.—1.12 mi. same road, S.A.P. 47-R-1, Carter Co.—0.415 mi. Bellefonte-Princess Rd., S.A.P. 176A, Boyd Co.—0.492 mi. same road, S.A.P. 176-B, Greenup Co. B. Johnson, chn.

Louisiana—June 2, by State Hy. Comn., Baton Rouge, concrete surfacing 9.181 mi. road between Gillis and intersection with Route 22, Calcasieu and Beauregard Parishes—15.7 mi. Benton-Plain Dealing Hy., Bossier Parish — 4.91 mi. Sulphur-Carlyss Hy., Calcasieu Parish —13.5 mi. hy. between Fenton and intersection with Route 2, Jefferson Davis Parish—10.6 mi. Transylvania-Enoka Hy., East Carroll and Madison Parishes—asphaltic surface treating 4.1 mi. Harrisonburg-Sicily Island Hy., Catahoula Parish —grading, drainage structures 13.219 mi. Powhattan-Hanna Hy., Natchitoches and Red River Parishes. H. B. Henderlite, hy. engr.

Louisiana — June 2, by State Hy. Comn., Baton Rouge, asphaltic surface treating 6.7 mi. Savoies-Raceland Hy., Lafourche Parish—14 mi. Tallulah-St. Joseph Hy., Madison Parish—grading, drainage structures 10.2 mi. White Castle-Donaldsonville Hy., Iberville and Ascension Parishes—concrete surfacing 7.387 mi. Chopin-Zimmerman Hy., Natchitoches and Rapides Parishes—9.07 mi. hy. north and south through Lafayette, Lafayette Parish. H. B. Henderlite, hy. engr.

Maryland—May 26, by State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 2.1 mi. Contr. Ch-103-84, Charles Co. — concrete shoulders on 8.26 mi. Contr. Cl-97-511, Carroll Co.—macadam paving 2.94 mi. Contr. H-120-44, Harford Co.—1.17 mi. Contr. W-91-62, Washington Co.—0.55 mi. Contr. S-50-14, Somerset Co.

Massachusetts—May 26, by Dpt. P. Wks., State House, Boston, bituminous macadam paving 18,665 ft. hy. Monterey — 6,099 ft. Ludlow — gravel and bituminous macadam paving 2,782 ft. Freetown—5,300 ft. Boxford—3,400 ft. Sterling — bitulithic concrete paving 1,918 ft. West Bridgewater. A. W. Dean, Dpt. P. Wks., Boston, engr.

Massachusetts — June 2, by Dep. P. Wks., State House, Boston, bituminous macadam paving 9,020 ft., constructing concrete bridge over Central Vermont R.R., and steel concrete bridge over Moore St., Erving; bituminous macadam paving 24,441 ft., constructing steel stringer extension to concrete arch bridge, Newbury and Rowley. A. W. Dean, Dpt. P. Wks., Boston, engr.

Michigan—May 29, by W. J. Kingscott, div. engr., Grand Rapids, grading, shaping, drainage structures, concrete paving 5.397 mi. M041-21C-2, Kent Co., 20 ft., for State Hy. Comn., Lansing.

Michigan—June 2, by A. L. Burridge, div. engr., Cadillac, grading, shaping, drainage structures, concrete surfacing 6.411 mi. F041-11C-1, Alpena Co., 20 ft., for State Hy. Comn., Lansing.

Michigan—June 3, by J. T. Sharpensteen, div. engr., Escanaba, grading, drainage structures 4.915 mi. F027-25C-1, Gogebic Co., for State Hy. Comn., Lansing.

Minnesota—June 2, by State Hy. Dpt., St. Paul, grading, culverts on 9.9 mi. S.P. 2-30, Sect. 4—18.7 mi. S.P. 12-33, S.P. 17-23 and S.P. 48-23—10.8 mi. S.P. 14-25, Sect. 2, Div. B—14.4 mi. S.P. 36-21, Sect. 3. Eng. Dpt., State Hy. Dpt., St. Paul, engrs.

Minn., Duluth—May 28, by W. Borgen, aud. St. Louis Co., Court House, grading, graveling 3.9 mi. S. A. Rd. 7—2 mi. Co. Rd. 24—2,000 ft. Co. Rd. 15—4,224 ft. Co. Rd. 70—1.5 mi. Co. Rd. 333—1,320 ft. Co. Rd. 335—2 mi. Co. Rd. 335—2.5 mi. Co. Rd. 336—10 mi. Co. Rd. 337—3 mi. Co. Rd. 346—3 mi. Co. Rd. 346—2 mi. Co. Rd. 20—2 mi. Co. Rd. 27—1 mi. Co. Rd. 66—1 mi. Co. Rd. 447—grading 0.4 mi. Co. Rd. 597—2 mi. Co. Rd. 69—1 mi. Co. Rd.—33—1,700 ft. Co. Rd. 453—frost heave prevention on 5.8 mi. S.A.P. 7—ditching 0.25 mi. along Co. Rd. 86—18 mi. Co. Rd. 143—1 mi. Co. Rd. 331—1,215 ft. Co. Rd. 333—0.5 mi. Co. Rd. 338—1,485 ft. Co. Rd. 346—bridges on Co. Rd. 560—Co. Rd. 104, $60,714. S. Shepard, co. engr.

Missouri—May 29, by State Hy. Bd., Jefferson City, improving hys. in Benton, Bollinger, Boone, Calloway, Chariton, Clark, Dallas, Daviess, Franklin, Gasconade, Laclede, Lafayette, Lawrence, Lewis, Livingston, Madison, Marion, Montgomery, New Madrid, Pike, Randolph, St. Clair, St. Francois, St. Louis, Scotland, Stoddard, Texas, Vernon, Washington, Worth and Wright Counties. T. H. Cutler, state hy. engr.

Mo., St. Louis—June 9, by Bd. P. Serv., City Hall, asphalt paving 5,610 sq.yd. 12th Blvd., $42,800 — 10,640 sq.yd. Gravois Ave from Geyer Ave. to 18th St., $67,800—27,060 sq.yd. Gravois Ave. from Arsenal to Cherokee Sts., $155,440 — 7,325 sq.yd. Gravois Ave. from Cherokee St. to Grand Blvd., $53,440—4,250 sq.yd. Utah St., $27,200—4,500 sq.yd. University Circle, $22,800—1,655 sq.yd. Tamm Ave., $10,400 — warrenite bitulithic paving 1,250 sq.yd. Tholozan St., $7,960—vibrolithic concrete paving 2,995 sq.yd. Bulwer St., $13,080 — concrete paving 4,415 sq.yd. Lansdowne St., $10,960—4,325 sq.yd. Chippewa St., $10,640—13,550 sq.yd. Morganford Rd., $40,600 — Sharp Ave. Sewer 1, 1,685 ft. 10- to 21-in. vitr. clay pipe, $9,240. W. W. Horner, city engr.

Mo., St. Louis—June 16, by Bd. P. Serv., City Hall, asphalt paving 2,500 sq.yd. Emma Ave.—2,900 sq.yd. Lexington St.—1,615 sq.yd. Wyoming St. from Bway. to 9th St. — 2,295 sq.yd. Wyoming St. from 9th to 13th Sts.—2 in. cold bituminous on trap rock and emulsified asphalt aggregates paving 700 sq.yd. Watson Rd. from Pernod to Marquette Sts.—540 sq.yd. Watson Rd. from Marquette to Maurice Sts.—375 sq.yd. same road from Maurice St. to Fyler Ave.—1,900 sq.yd. same road from Pernod to Maurice Sts.—hot mix stone filled bituminous paving 500 sq.yd. same road from Maurice St. to Fyler Ave.—grading, concrete paving alleys in City Blocks 1656, 2756, 2826, 4383SA, 4415. $79,910. W. W. Horner, city engr.

New Hampshire—May 28, by State Hy. Dpt., Concord, 6 in. one course rein.-conc. on 8 in. gravel base course surfacing 25,084 sq.yd. Daniel Webster Hy., Plymouth $123,000.

N. J., Bayonne—See "Contracts Awarded."

N. J., Jersey City — May 28, by Bd. Freeholders Hudson Co., Court House, grading, stone block on concrete paving 5,450 sq.yd. Tonnelle Ave. from Hudson Blvd. to State Hy. 1. $25,-000 or more. F. J. Radigan, Court House, co. engr.

New York—June 9, by A. W. Brandt, comr. Hys., Albany, improving hys. in Franklin Co.; reconstructing hys. in Cattaraugus, Essex, Franklin, Herkimer, Monroe, Nassau, Schuyler, Suffolk, Warren and Wayne Counties; adv. E. N.-R. May 21.

N. Y., New York—May 28, by S. Levy, pres. Manhattan Boro, Municipal Bldg., sheet asphalt on concrete paving University Pl., West 61st, Cannon, Ann and East 95th Sts.—asphalt block on concrete paving Park Ave.—4 in. granite block on concrete paving Bond St.

N. Y., St. George—May 27, by J. A. Lynch, pres. Richmond Boro, Boro Hall, bituminous concrete paving Guyon Ave.; grading, curbing, vitr. brick guttering Macfarland Ave.

O., Garfield Heights—May 25, by City, paving Maplerow, Christine, Rexwood and Saybrook Aves. To exceed $25,000. R. Munz, City Hall, engr.

Pennsylvania — June 5, by State Hy. Dpt., Harrisburg, constructing roads in Centre, Clarion, Jefferson, Indiana, Clearfield, Lancaster, Lycoming, Pike and Schuylkill Counties. S. S. Lewis, hy. engr.; adv. E. N.-R. May 21.

Pa., Brackenridge—May 28, by G. H. Dickey, council secy. grading, curbing, guttering, sewers, 8 in. concrete paving 2,340 sq.yd. Morgan St. C. E. Miller, Jenkins Arcade, Pittsburgh, engr.

Pa., Charleroi—June 2, by R. A. Roberts, boro secy., concrete paving 1,350 ft. Prospect Ave., 16 and 20 ft. $25,000. McDonald & Bigler, Boro Bldg., engrs.

Constr. News page 217

Streets and Roads (Continued)

Pa., Greensburg — May 29, by G. A. McDowell, controller Westmoreland Co., rein.-con. surfacing 7,948 ft. Latrobe-Youngstown Rd., 16 and 20 ft. W. A. Wynne, Greensburg, engr.

Pa., Munhall—City Council soon takes bids concrete paving, and 25,000 ft. 8- to 18-in. sanitary sewers. $500,000. F. B. Sheaffer, Munhall, engr.

Pa., Phila.—June 2, by Bureau Hys., Dpt. P. Wks., City Hall Annex, A. Murdock, dir., Schedule A, grading Aramingo St. from Ontario to Tioga Sts.—Cresheim Rd. from Allens Lane to Emlin St.—Schedule B, redressed granite block repaving Race and Vine Sts. from 6th to Franklin Sts. — Schedule C, asphalt paving (assessment work) Bath St. from Victoria to Pacific Sts.—Pacific St. from Allen to Bath Sts. —Belgrade and Edgemont Sts. from Venango to Pickwick Sts.—Mt. Pleasant St. from Forrest to Cheltenham Sts.—Salmon St. from Pickwick to Castor Sts. — State Rd. from Barton to Cottman Sts. — Stenton St. from Ogontz to Broad Sts.—Schedule D, asphalt paving Berks St. from 9th to 11th Sts.—Walnut St. from 38th to 39th Sts.—Schedule E, redressed granite block repaving Green Lane from Manayunk to Pechin Sts.

Tex., Amarillo—E. N. Stanley, city engr., taking bids, 2½ in. brick on 4 in. concrete, 2¼ in. brick on 6 in. limestone base or rein.-con. paving 8 blocks N Ave. from Fillmore to Austin Sts., 30 ft. $35,000.

Tex., Corsicana—June 1, by Navarro Co., c/o J. M. Tullos, aud., grading, drainage structures and overpass over Houston & Texas Central R.R., on Hardy Ave. A. F. Mitchell, Corsicana, co. engr.

Virginia—June 2, by State Hy. Dpt., Richmond, roads in Augusta, Buckingham, Charlotte, Henrico, Hanover, Middlesex, Patrick, Smyth, Warren, and Westmoreland Counties. H. G. Shirley, hy. comr.

Washington—June 2, by S. J. Humes, dir. State Hys., Olympia, crushed stone resurfacing 10.3 mi. State Rd. 6, McCloud Creek to Cusick, Pend Orielle Co.—7.6 mi. State Rd. 5, Morse Creek to 2 mi. west of Chinook, Yakima and Pierce Counties—bituminous treated surfacing 33.8 mi. State Rd. 5 from Morse Creek to Carmack Bridge, Kittitas and Yakima Counties—31 mi. State Rd. 8, Toppenish to last crossing Satus Creek, Yakima and Klickitat Counties—152 mi. sections State Rds. 3 and 11, in Benton, Franklin, Columbia, Garfield and Asotin Counties.

Wash., Chehalis—Comrs. Lewis Co., bids about June 8, extending 2.77 mi. Winlock-Vader Rd. R. L. Greene, Chehalis, co. engr.

Wash., Seattle — Bd. P. Wks., bids about July 1, widening, repaving, rebuilding street car line, watermains and sewers in Bway. North, et al. $90,400. R. H. Thomson, city engr.

Wash., Yakima—Comrs. Yakima Co., Court House, bids about June 8, paving 2.5 mi. Selah-Gore Rd. O. E. Brashears, Yakima, co. engr.

Wisconsin—May 26, by State Hy. Comn. and Hy. Com. Monroe Co., Supervisor's Room, Court House, LaCrosse, grading, crushed stone surfacing 7,700 cu.yd. Norwalk-Wilton Rd., S.T.H. 71, S.A.P. 5315, Monroe Co.

Wisconsin—May 27, by State Hy. Comn. and Hy. Com. Douglas Co., Superior, grading 0.75 mi. Superior-Port Wing Rd., S.T.H. 13, S.A.P. 8391, 8394 and 8392, Douglas Co.

Ont., L'Orignal—Prescott and Russell Counties, expending $85,000, grading, drainage structures, culverts, graveling, macadam paving roads. Mostly maintenance by day labor. T. H. Byrne, 71½ Sparks St., Ottawa, engr.

Quebec—May 22, by Providence, Dpt. Roads, Parliament Bldgs., Quebec City, J. E. Perrault, minister, J. L. Boulanger, deputy minister, bituminous paving in St. Jerome de Matane, Trois Pistoles, Notre Dame du Lac, St. Redempteur, St. Georges East, Disraeli, Lambton, Cowansville, Roxton Falls, Sweetsburg, Iberville, St. Antoine de Padoue, L'Ange Gardien de Rouville, Ste. Julienne and St. Pacome.

CONTRACTS AWARDED

Arizona—State Hy. Comn., Phoenix, grading, placing subgrade stabilizer, oil processing 10.5 mi. Wickenburg-Hot Springs Junction Hy., to G. H. Oswald, 366 East 58th St., Los Angeles, Calif., $70,250.

Arizona — State Hy. Comn., Phoenix, oil processing and subgrade stabilizer on Solomonville-Duncan Hy., to Skeels & Graham Co., Consolidated Bank Bldg., Tucson, $71,017.

California—State Hy. Comn. Sacramento, grading Lassen-Modoc Hy. (Joint Hy. Dist.), to W. C. Colley, 35 Northampton Ave., Berkeley, $52,567. Noted Apr. 16.

Calif., Los Angeles—Bd. P. Wks., City Hall, grading, Willite processed asphaltic concrete on asphaltic concrete paving La Brae Ave., to Hollywood Paving Co., 8525 West 3rd St., $44,650.

Calif., San Jose—Bd. Comrs. Santa Clara Co. oil macadam surfacing 212,280 sq.ft. Church Ave., to Granite Constr. Co., Watsonville, $22,050—204,875 sq.ft. Pearl Ave., to San Carlos Paving Co., San Carlos and Dupont Sts., $11,485—asphaltic concrete paving 15,255 sq.ft. Lincoln Ave., to Union Paving Co., Call Bldg., San Francisco, $1,948. Grand total $35,480.

Calif., San Rafael—R. Graham, clk. Marin Co., grading 3 mi. San Geronimo-Nicasio Rd., to F. J. Main, Fairfax, $26,405. Noted Apr. 23.

Calif., Santa Ana — Orange Co., grading, culverts, 100,000 unclassified excav., Santiago Canyon Rd., to Berne Co., 1225 North Serrano Ave., Los Angeles $36,857. Noted Apr. 23.

Colorado—State Hy. Dpt., Denver, gravel surfacing 7.534 mi. State Hy. 2, Federal Aid Project 189-C, Routt and Moffatt Counties, to H. L. Hoffman, D.A.C. Bldg., Denver, $115,357.

Conn., New Haven—Sheet asphalt paving York St., to C. W. Blakeslee & Sons, Inc., 58 Waverly St., $8,640; College and George Sts., to Webb Asphalt Paving Corp., 69 Middletown Ave., $16,880. Est. $25,000.

Idaho—A. Harbour, comr. P. Wks., Boise, grading, crushed rock surfacing 3.867 mi. Lewis Co. and 6.432 mi. Benewah Co., to M. J. Kuney Co., Hutton Bldg., Spokane, Wash., $52,269 and $64,958 respectively est. $73,072 and $81,722 respectively—10,938 mi. Idaho Co., to Triangle Constr. Co., 220 Ude St., Spokane, Wash., $122,775 est. $156,274—2,914 mi. Boise Co., to W. H. Puckett Co., Boise, $35,598 est. $57,678. Grand total $275,600. Noted Apr. 28 Daily.

Illinois — State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, to P. J. Crowley Co., Maywood, paving Route 60, Sect. P-1, Cook Co. $15,095—to Hartman-Clark Bros., 920 Peoria Life Bldg., Peoria, Marshall Co. $19,955—to Henkle Constr. Co., Mason City, Ia., Jersey Co. $124,330—to W. Lough & Sons, Marion, Richland and Edwards Counties, $93,073; Edwards Co. $97,123—to J. Kesl & Sons, Edwardsville, Jackson Co. $125,462; Perry and Jackson Counties, $96,810—to Arcole Constr. Co., Niles Center, Will and DuPage Counties, $152,935; Cook and DuPage Counties, $102,453—to Barnett & McCoy Constr. Co., Equality, Union Co. $24,544—to Birt Bros., Decatur, McDonough Co. $177,772—to Pronger Bros., Blue Island, Route 1, Sect. 161-Y, Cook Co. $18,049—to C. E. Girtz & Sons, Elgin, Route 5, Sect. 7-Y, Cook Co. $169,653—to F. P. McFarland, Joliet, Route 4, Sect. 28-Y, $72,293; Route 4, Sect. MY, $27,942, both Will Co. — to H. Zolper & Sons, Mendota, La Salle Co. $45,891—to J. A. Shepherd Co., Terre Haute, Ind., Route 132, Sect. 101-X, $7,232; Route 48, Sect. 128-X, $15,027; Route 121, Sect. 139-X, $5,990, all Macon Co.; Route 121, Sect. 148-X, $3,654; Route 121, Sect. 149-X, $7,887; Route 121, Sect. 150-X, $6,039, all Edgar Co.—to E. D. Otto, Downers Grove, DuPage Co., $59,335 — to R. B. Potashnick, Cape Girardeau, Mo., grading Williamson and Johnson Counties, $81,697. Grand total $1,550,221. Noted Apr. 9.

Indiana—State Hy. Comn., Indianapolis, grading, drainage structures, concrete surfacing 130,977 sq.yd. roads in Cass and Pulaski Counties, to Meneeley Constr. Co., Frankfort, $167,812 est. $232,474; 67,414 sq.yd. Allen Co., to Tri-Lake Constr. Co., Columbia City, $84,852 est. $102,975. Noted Mar. 19.

Ind., Anderson—Madison Co., concrete surfacing Ivor Davies Rd., to Angelmeyer Bros., Elwood, Ind., $17,173 est. $25,000; curbing, concrete surfacing Cedar St., to Daniels & McVaugh, Anderson, $17,850 est. $25,000.

Ind., Valparaiso—Bd. Comrs. Porter Co., concrete surfacing 5.31 mi. B. T. Kemil Rd., and 2.994 mi. F. C. Linderman Rd., to Sunderman Constr. Co., Gary, $92,732 and $29,299 respectively, est $122,227 and $34,200 respectively. Noted Apr. 23.

Ia., Cherokee—Cherokee Co., grading secondary road system, to I. E. Hunt & Son, Omaha, Neb., $31,628.

Ia., Cresco—Bd. Comrs. Howard Co., grading, incidental work 7 mi. trunk roads, to W. R. Garland, New Hampton, $10,435. Noted Apr. 2.

Ia., Denison — Crawford Co., improving Charter Oak-Dunlap Rd., incl. 88,513 cu.yd. excav., 3,000 cu.yd. channel change, 105,000 sta.yd. overhaul, to W. H. Dugan & Sons, 4202 California St., Omaha, Neb. Noted Apr. 16.

Ia., Des Moines—Polk Co., gravel surfacing secondary road system, to Clark and L. J. Peters, 3400 Carlisle Rd. $18,876.

Ia., Eldora—Hardin Co., gravel surfacing 60 mi. trunk and local roads, to Nelson & Melhon, Nevada, $20,388.

Ia., Emmetsburg—Bd. Comrs. Palo Alto Co., gravel surfacing secondary road system, to Bauck Constr. Co., Emmetsburg, $27,715. Noted Apr. 16.

Ia., Garner—Hancock Co., gravel surfacing secondary road system, to W. B. Williams, Algona, grading secondary road system, to G. C. Brooks, Whiting, $10,775.

Ia., Iowa City—Johnson Co., grading secondary road system, to Amer. Constr. Co., Iowa City, $36,661.

Ia., Montezuma—Bd. Comrs. Poweshiek Co., grading trunk and local roads, to Partello Road Co., Waterloo, $35,477—concrete culvert pipe, incl. 400.96 cu.yd. concrete, to Iowa Bridge Co., 1901 Easton Blvd., Des Moines, $8,220—corrugated culvert pipe, to Wheeling Corrugating Co., 100 Southwest 2nd St., Des Moines, $3,542. Grand total $47,239.

Ia., Newton—Bd. Comrs. Jasper Co., grading secondary road system, to J. J. Lamoreaux, 3848 Seward St., Omaha, Neb., $39,322.

Ia., Sioux City — Woodbury Co., grading secondary road system, to Thom Bros., Ashton, $3,003; 22 culverts, to B. O. Dorn, South Sioux City, Neb., $16,100.

Ia., Storm Lake—Buena Vista Co., gravel surfacing secondary road system, to A. L. Albrecht, Storm Lake, $27,330.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures, surfacing 1.132 mi. roads in Caldwell Co., to Corum Bros., Madisonville, $20,792—grading, drainage structures 6.354 mi. Franklin Co., to L. A. Gridley Constr. Co., Wray Ave., Knoxville, Tenn., $73,067—bridge over McCools River, also grading approaches, Carroll Co., to Woodruff & Co., 1046 Barrett St., Louisville, $49,997. Grand total $143,856. Noted Apr. 9.

Kentucky—State Hy. Dpt., Frankfort, rock asphalt on concrete surfacing 0.106 mi. Boyd Co., to Hunt-Forbes Constr. Co., Ashland, $6,815 — light tar and asphalt cut-back on waterbound macadam surfacing 10.845 mi. Lincoln Co., to Stone Constr. Co., 452 South Pearl St., Columbus, O., $138,815—grading, drainage structures, using 1st class pipe 8.708 mi. Casey Co., to Wilmore Constr. Co., Wilmore, $60,092—grading, drainage structures, using corrugated metal pipe 4.12 mi. Kenton Co., to G. M. Francisco, 3647 Stettinius St., Cincinnati, O., $78,403—8.833 mi. Crittenden Co. and bridge over East Fork Clarks River, Calloway Co., to R. F. Pryor, Mayfield, $46,615 and $23,975 respectively. Grand total $354,715. Noted Mar. 19.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 1.2 mi. Contr. H-119-42, Harford Co., to Harry T. Campbell & Sons Co., Towson, $19,293. Noted Apr. 23.

Maryland—State Roads Comn., G. C. Uhl, chn. Baltimore, macadam paving 4.2 mi. Contr. H-110-42, Harford Co., to T. B. Gatch Building & Contg. Corp., Raspeburg, Baltimore, $75,857; macadam paving 3.91 mi. Contr. H-113-44, Harford Co., to T. E. Russell, Frederick, $62,644. Noted Apr. 16.

Maryland — State Roads Comn., Baltimore, G. C. Uhl, chn., macadam resurfacing 1.25 mi. Contr. Ho-90-52, Howard Co., to T. P. Murray, Towson, $23,468. Noted Apr. 12.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, concrete shoulders 3.05 mi., Dorchester Co., to Old Line Contg. Co., Chestertown, $14,350; concrete curbing, concrete shoulders and concrete surfacing Rhode Island Ave., Prince Georges Co., to J. P. Lavezza, 911 Eastern Ave., Baltimore, $4,717. Noted Apr. 30.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 0.94 mi. Contr. Ch-101-84, Charles Co., to Jarboe & Haughton, Mechanicsville, $11,492. Noted Apr. 16.

Maryland — State Roads Comn., G. C. Uhl, chn., Baltimore, penetration macadam paving 1 mi. Contr. Ho-03-52, Howard Co., to M. J. Grove Lime Co., Lime Kiln, $18,604; grading 2.74 mi. Contr. BC-1010-72, Baltimore City, to Potts & Callahan, Knickerbocker Bldg., Baltimore, $20,094. Noted Apr. 23.

Maryland—State Roads Comn., Baltimore, G. C. Uhl, chn., concrete paving 0.66 mi. Contr. D-68-17, Dorchester Co., to P. D. Phillips & Bro., Salisbury, $22,880. Noted Apr. 9.

Md., Baltimore — Bd. Awards, bituminous flushing roads, streets, to J. Gibbons, Guilford and University Aves., $69,965.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., Boston, bituminous macadam paving 5,450 ft. Billerica, to R. G. Watkins & Son, Inc., 47 Main St., Amesbury, $36,967; bituminous macadam paving 22,120 ft. and 1,030 ft. Bellingham, Milford, Hopedale and Mendon, to G. Bonazzoli & Sons, Hudson, $180,006. Noted Apr. 23.

Massachusetts—Dpt. P. Wks., A. W. Dean, engr., Boston, bituminous macadam paving 24,096 ft., and 17,569 ft. hy. Duxbury, Kingston and Pembroke, to Eastern Contr. Co., 494 Washington St., Quincy, $318,886. Noted Apr. 23.

Massachusetts—Dpt. P. Wks., State House, Boston, graveling 4,650 ft. and grading 900 ft. hy. Spencer, to J. Chesarone, 915 Chestnut St., Waban, $13,181 — bitulithic concrete paving 9,800 ft. East Bridgewater, to D. J. Roach, 57 Spring St., East Bridgewater, $57,703—bituminous macadam paving 4,900 ft. Hancock, to A. Pallotto, Bridge St., Dracut, $22,137—2,000 ft. Charlton, to Perini & Ampollini, 242 Waverly St., Framingham, $11,181—3,250 ft. Gardner, to Frank & Frank Constr. Co., 9 Doyle Ave., Providence, R. I., $15,987. Grand total $120,189. Noted Apr. 30.

Mass., Arlington—Town, W. J. Toomey, supt. P. Wks., Town Hall, widening, reconstructing Mass. Ave. from Central St. to Highland Ave., to J. P. McCabe, Inc., 509 East 1st St., South Boston. Est. $90,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., bitulithic paving East 8th St., South Boston, to J. A. Singarella, Park Sq. Bldg., $31,716; bitulithic paving Market St., Brighton, to C. J. Maney, 55 Fargo St., $77,213.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., granite block paving Congress St. from Sleeper St. to New York, New Haven & Hartford R.R., to Baker Constr. Co., 1578 Tremont St., Roxbury, $16,641 est. $25,000; sheet asphalt paving Dudley St., Roxbury, to S. J. Tomasello, 15 Bay St., Dorchester, $32,796. Noted Apr. 30.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Maverick and Tyler Sts., East Boston, to A. Singarella, 22 Tremlett St., Dorchester, $17,098. Est. $25,000.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Magazine St., Roxbury, to A. Singarella, 22 Tremlett St., Dorchester, $44,243; North Harvard St., Brighton, to A. R. Doyle, 44 Perkins St., Jamaica Plain, $42,954.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sheet asphalt paving Linden and Astoria Sts., to M. F. Malley, 96 Tyndale St., Roslindale, $13,589 and $10,680 respectively.

Mass., Melrose—City, H. H. Stuart, school com., grading, retaining wall about Ripley School, and grading about Lincoln School, to G. Rotundi & Sons, 199 Laurel St. Est. $25,000.

Mass., Swampscott — For earth and ledge excav., asphalt resurfacing Phillips Ave., to M. McDonough Co., Broadway, Malden. Est. $25,000.

Mass., Waltham—City, H. F. Beal, city engr., concrete sidewalks, curbings, to P. J. O'Malley, 82 Massasoit St., $18,815. Est. $25,000.

Mass., Wellesley — Water, Light and Sewer Comrs., asphalt resurfacing to D. S. Bell, 169

Constr. News page 218

Streets and Roads (Continued)

Glen Rd., Wellesley Hills, $25,000. Noted Apr. 9.

Michigan—E. R. Benkert, resident engr., Port Huron, grading, shaping, drainage structures, 2 course gravel surfacing 9.445 mi. MO74-33C-1 and MO79-27C-1, Sanilac and Tuscola Counties, 18 ft., to Royal Oak Constr. Co., Birmingham, for State Hy. Comn., Lansing. $84,663. Noted Apr. 23.

Michigan—E. R. Benkert, resident engr., Port Huron, grading, drainage structures, shaping, 10.256 mi. F044-26, Contr. 1, Lapeer Co., to C. A. Handyside Co., Detroit, for State Hy. Comn., Lansing. $83,105. Noted Apr. 23.

Michigan—H. W. Hagaman, div. engr., Saginaw, grading, shaping, drainage structures, concrete surfacing 1.842 mi. MO73-7, Contr. 3, Saginaw Co., 20 ft., to C. A. Handyside Co., Detroit, $40,299.

Mich., Lapeer—Lapeer Co. Road Comn., shaping drainage structures, Class B gravel surfacing 7.9 mi. roads, 12 ft., to Baxter Cartage Co., 5143 Bangor Ave., Detroit, $34,738.

Minnesota—State Hy. Dpt., St. Paul, paving 220,500 sq.yd. S.P. 64-24, Div. A, to S. J. Groves & Sons Co., 529 South 7th St., Minneapolis, $271,946—262,000 cu.yd. S.A.P. 2-41 and 358,000 cu.yd. S.P. 23-28-1, to W. W. Magee, 116 West 6th St., St. Paul, $64,203 and $117,240 respectively—126,000 cu.yd. S. P. 8-25, to T. Pallin, Plummer, $27,924—214,000 cu.yd. S.P. 9-30-2, to J. and F. H. Brown, Madison Lake, $55,613—53,000 cu.yd. S.P. 57-21, to C. Weaver, Anoka, $29,115. Grand total $566,041. Noted Apr. 23.

Mississippi—State Hy. Comn., Jackson, improving 8.523 mi. roads in Washington Co., to O. M. New, Little Rock, Ark., $92,978—2.67 mi. Copiah Co., to Rast & Griffith, Inc., Gadsden, Ala., $10,862—5.06 mi. Pear River Co., to Cooper Bros. Constr. Co., Moselle, $34,011—1.4 mi. Warren Co., to Clark Bros. Constr. Co., 920 Peoria Life Bldg., Peoria, Ill., $32,990—Madison Co., to W. W. Burkes, Phila., Pa., $1,636. Grand total $171,977. Noted Apr. 16.

Missouri—State Hy. Bd., Jefferson City, to C. L. Johnson, Warrensburg, chat surfacing 2.638 mi Johnson Co., $9,326; 3.296 mi. Johnson Co. $10,798; 2.585 mi. Lafayette Co. $3,063; 2.727 mi. Lafayette Co. $3,839; grading, concrete paving 1.615 mi. Andrew Co. $39,194; 3.288 mi. Holt Co. $28,475—to Service Constr. Co., Poplar Bluff, 0.723 mi. Madison Co. $23,-110—to C. H. Atkinson Paving Co., Watertown, S. D., 0.877 mi. Daviess Co. $5,262; 4.029 mi. Daviess Co. $22,836 — 4.244 mi. DeKalb Co. $24,871; 3.975 mi. Daviess Co. $23,168—to E. D. Tyner Constr. Co., 14th and Elmwood Sts., Kansas City, 3.777 mi. Lafayette Co. $29,363; 0.491 mi. Lafayette Co. $14,590—to C. N. Lund, 815a Chestnut St., St. Louis, 1.495 mi. Jefferson Co. $30,279; 3.498 mi. Jefferson Co. $82,968; 4.81 mi. Jefferson Co. $134,026—to D. Tanner, Charleston, grading 2.5 mi. Wayne Co. $15,074—to A. W. Mosley, Kansas City, 4.066 mi. Atchison Co. $14,020—to M. Wunderlich, Snell Ave., St. Paul, Minn., 3.401 mi. Cole Co. $26,989; 3.619 mi. Cole Co. $27,775; 3.619 mi. Cole Co. $27,080—to Pioneer Constr. Co., 270 Glover Bldg., Kansas City, crushed stone surfacing 1.568 mi. Mercer Co. $26,023—to M. Haase, St. Joseph, 4.207 mi. Mercer Co. $30,231; 3.218 mi. Mercer Co. $33,034; 2.706 mi. Mercer Co. $13,485 — to P. P. Hinote, Oakville, Ia., graveling 4.621 mi. Clark Co. $3,889; 4.868 mi. Clark Co. $3,627; 4.788 mi. Clark Co. $5,111—to H. H. Ruddell, Springfield, 3.157 mi. Dent Co. $24,086; 1.796 mi. Dent Co. $13,434; 1.895 mi. Dent Co. $13,230—to D. Fike, Competition, 2.541 mi. Mississippi Co. $5,435; 4.007 mi. Stoddard Co. $4,647—to M. E. Gillioz, Monett, 3.712 mi. Polk Co. $28,228; 3.915 mi. Pork Co. $31,132 — to Kiefner & Gerle, Perryville, 0.833 mi. Perry Co. $7,540 — to O. O. Fuller, Nevada, 3.385 mi. Cass Co. $8,298; 3.295 mi. Cass Co. $8,172. Grand total $855,708. Noted Apr. 23.

Mo., Louisiana—Tarvia paving 12 blocks in business section, to Barrett Co., 3rd and Convent Sts., St. Louis.

Mo., St. Joseph—Park Bd., V. Burt, secy., Type B asphaltic concrete paving Hyde Park Dr., to Land Constr. Co., Corby Bldg., $16,800; Type B bituminous emulsion paving Krug Park Driveway, to P. P. Young, 4209 St. Joseph Ave., $17,949.

Mo., University City—E. L. Burns, city clk., City Hall, grading, 2 in. asphalt on concrete paving 1,100 ft. Belmar Blvd., 54 ft., to Granite Bituminous Paving Co., Railway Exch. Bldg., St. Louis, $22,315.

Montana—State Hy. Comn., Helena, to Hargrave Constr. Co., Spokane, Wash., oil surface treating Georgetown Lake Rd., Deer Lodge Co., $22,814 est. $20,021 — to Stevens Bros., 612 Endicott Bldg., St. Paul, Minn., crushed graveling road in Jefferson, Gallatin and Madison Counties, $70,352 est. $165,631—to L. E. Smith, Billings, 14.303 mi. Big Horn Co., $51,155 est. $72,297—to T. Staunton, Great Falls, 10.331 mi. Judith Basin Co., $108,116 est. $127,935; road in Lewis and Clark Co., $302,693 est. $370,513; 14.655 mi. Wheatland Co., $109,098 est. $125,634—to Nolan Bros., 18 North 2nd St., Minneapolis, Minn., 11.295 mi. Powell Co., $206,539 est. $246,770—Clifton Applegate & Toole, Hutton Bldg., Spokane, Wash., road in Missoula and Lake Counties, $98,150 est. $93,-285—to L. V. Lockwood, Glasgow, bridges in Judith Basin Co., $8,402 est. $10,345; in Wheatland Co., $12,614 est. $15,902—to McLaughlin Constr. Co., Livingston, in Lewis and Clark Co., $25,269 est. $25,795—to J. Iten, Hamilton, in Missoula and Lake Counties, $10,965 est. $10,-153—to Dakota Concrete Co., Minot, in Powell Co., $18,085 est. $22,427. Grand total $1,044,-252. Noted Apr. 2.

Nebraska—Nebraska State Hy. Wks., Lincoln, to Booth & Olson Paving Co., 620 Insurance Exch., Sioux City, Ia., paving 7.5 mi. Dakota Co., $128,032—to Schlueter Bros., Fremont, 7.7 mi. Washington Co., $33,448 — to Western Asphalt Paving Corp., 2100 East 4th St., Sioux City, Ia., 1.8 mi. Sarpy Co., $34,422 — to Roberts Constr. Co., 404 1st Natl. Bank Bldg., Lincoln, 6.9 mi. Hooker Co., $55,085—to A. H. Read, Omaha, 4.9 mi. Scotts Bluff Co., $75,590—to Martin-Day Co., 312 Little Bldg., Lincoln, 9 mi. Richardson Co., $61,914 — to Amer. Paving Co., 1325 Grace St., Omaha, 9.5 mi. Dawson Co., $151,726; 5.7 mi. Madison Co., $199,199; 3 mi. Pierce Co., $49,227—to Natl. Constr. Co., 305 Arthur Bldg., Omaha, 1.7 mi. Sarpy Co., $27,275; 5.8 mi. Red Willow Co., $107,407; 3.8 mi. Red Willow Co., $78,960. Grand total $1,002,285.

Nevada—State Hy Dpt., Carson City, grading, graveling 16.86 mi. Elk Co., 24 ft. roadway, to Nevada Rock & Sand Co., Reno, $60,-095. Est. $70,601. Noted Apr. 28.

New Hampshire—State Hy. Dpt., Concord, 4 in. crushed gravel on 12 in. gravel paving 3.96 mi. Gorham Hill Rd., Jefferson, 21 ft., to Arborio Road Constr. Co., 525 Main St., Hartford, Conn., $49,147. Est. $73,000. Noted Apr. 30.

New Jersey—State Hy. Comn., Trenton, grading, sheet asphalt paving 23,297 sq.yd. Mercer Co., to Union Paving Co., Broad and Stiles Sts., Phila., Pa., $78,406. Noted Apr. 30.

New Jersey—State Hy. Comn., Trenton, improving 4.315 mi. Route 2, Sect. 6, Hasbrouck Heights, Bergen Co., to G. M. Brewster & Son, Bogota, $1,194,564. Noted Apr. 2.

N. J., Bayonne—Bd. City Comrs., City Hall, sheet asphalt repaving Bway., from 10th to 55th Sts., day labor. $280,000. W. Clarkson, city engr.

N. J., Freehold—Bd. Freeholders Monmouth Co., Court House, paving Shrewsbury Ave., extention, to Sost Constr. Co., Nutley, $27,610. Noted Apr. 23.

N. J., Jersey City — Bd. City Comrs., City Hall, grading, sheet asphalt on concrete paving Duncan and Monticello Aves., to Lettiere-Bellezza, 921 Bergen Ave., $13,062 and $23,097 respectively.

N. J., Jersey City—Bd. City Comrs., City Hall, grading, asphalt paving Coles St., to Municipal Constr. Corp., 26 Veterans Sq. Est. $25,000.

N. J., Keyport — Boro Council, rein.-con. paving Lloyd St. to Jannorone Constr. Co., Belleville, $21,499. Noted Apr. 30.

N. J., Prospect Park—Bd. Boro Council, Boro Hall, grading, curbing, mains, sewers, concrete paving North 7th St. and Brown Ave., to A. Vandermade, Planters Ave., $34,775. Noted May 1.

N. J., Ringwood—Bd. Boro Council, Manor School, grading, bituminous penetration macadam paving Ringwood Ave., to Union Building & Constr. Co., 150 Prospect St., Passaic, $35,859. Noted Apr. 23.

New York—A. W. Brandt, comr. Hys., Albany, concrete paving 5.8 mi. Steuben Co., to H. W. Patterson, Ellicott Sq., Buffalo, $228,881 est. $354,889—2.33 mi. Cortland Co., to C. D. Murray, Syracuse, $111,686 est. $132,606—2.51 mi. Essex Co., to D. W. Overacker, Brattleboro, Vt., $106,058 est. $136,205—3.71 mi. Rockland Co., to Union Asphalt Paving Co., Union City, N. J., $113,919 est. $178,582—0.79 mi. Wayne and Ontario Counties, to Cleveland & Sons Co., Brockport, $28,522 est. $36,740—grading 8.46 mi. Onondaga and Madison Counties, to Neilans & Walsh, Auburn, $226,286 est. $382,856—bituminous macadam paving 0.65 mi. Chenango Co., to F. Lewis & Sons, Inc., Bainbridge, $53,-164 est. $74,400. Grand total $868,516. Noted Apr. 16.

N. Y., Albany—City Council, repaving Quail St. and paving Holmesdale Ave., to E. V. Carey, 17 Erie St., $50,648 and $12,968 respectively—Lexington Ave., to Warren Bros. Roads Co., Albany, $25,224—trunk sewer in Davis Ave., to Sheehan Constr. Corp., 445 2nd St., $38,900; sewer for Harbor Hill Junior High School, to Kilby Bros., Inc., 71 Melrose Ave., $3,995. Grand total $131,735.

N. Y., Brooklyn—H. Hesterberg, pres. Brooklyn Boro, Boro Hall, to A. Di Geronimo, sidewalks on various streets, $6,750 — to B. Turecamo Contg. Co., New Cropsey Lane, asphalt paving Albany Ave., $7,844; Parrott Pl., $3,843; Troy Ave., $7,866; 73rd St., $15,253—to Carbloc Paving Co., Stagg St., Ashford St., $13,080; Freeman St., $8,347; Snyder Ave., $22,251—to Cranford Co., 52 9th St., Chauncey St., $119,919—to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., Douglass St., $25,809; Taylor St., $20,038; Woodhull St., $17,177. Grand total $268,177. Noted Apr. 16.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., grading 44th St. and 53rd Ave., to E. Calsi, $1,009 and $4,327 respectively—Northern Blvd., to Slattery Contg. Co., 7202 51st St., $26,777—ramps on boardwalk, to F. Movizzo Co., 1554 75th St., Brooklyn, $4,083. Grand total $36,196. Noted Apr. 2.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Highway Impvt. & Repair Co., Furmans Island, Brooklyn, asphalt paving 38th St., $18,524; 30th St. $21,-672; 30th Ave. $28,218; 31st Ave. $34,915; 37th Ave. $22,028; 21st St. $17,966; 49th Ave. $9,499; to Meehan Paving Co., Laurel Hill Blvd., Little Neck Parkway, $13,157; 41st St. $11,267; 36th Ave. $11,506; 21st Ave. $9,330; 53rd St. $7,030—to Sprague Constr. Co., Alemeda, Bell Harbor, North Hempstead Park $30,211; Ocean Ave. $18,189—to W. P. McDonald Co., 7 Lawrence St., Flushing, Cross Island Blvd. $18,295; Whitestone Blvd $45,-022; 31st Ave. $41,118—to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, 35th Ave. $58,756—to Carbloc Paving Co., Stagg St., Brooklyn, Northern Blvd., $11,206; Cornelia Ave. $9,607—to Ackerman & Schierenberg, 1728 Stevens St., Brooklyn, 202nd St $15,892 — to Bruger Contg. Co., 1154 Cypress Ave., Ridgewood, grading 111th St $30,505—to Kennedy & Smith, Bradford Ave., Flushington, restoring walks, $4,794—to J. Soverio, strengthening water conduits in Lefferts Blvd. $4,359. Grand total $493,066. Noted Apr. 26.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., granite block paving Whitlock Ave., to St. George Paving Co., 415 Lexington Ave., $70,-770—asphalt block paving East 150th St., to Regan Towers Co., 124 West 121st St., $13,230—asphalt paving East 174th St., to Venetian Contg. Co., 2 Lafayette St., $6,459—grading Stadium Ave., to F. Gabrielle, 2763 Reservoir Ave., $11,561—Dean Ave., to F. Del Balso, 2551 Cruger Ave., $3,795—curbing Odell St., to C. Turiano Contg. Co., 2913 Coddington Ave., $1,735—sewer in Bell Ave., to F. Pestone, 2410 Bathgate Ave., $7,309. Grand total $114,859. Noted Apr. 30.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, grading, concrete paving Arthur Kill Rd., to Mannuli Constr. Co., 1780 Pitkin Ave., Brooklyn, $39,055. Noted Apr. 30.

Ohio—O. W. Merrell, dir. hys., Columbus, concrete widening 0.957 mi. hy. Hamilton Co., and concrete paving 5.854 mi. Clermont Co., to N. Cenci, 1381 Essex Ave., Columbus, $41,380 and $216,981 respectively—0.586 mi. Richland Co., to A. J. Baltes, Norwalk, $11,972—3.775 mi. Mercer Co., to R. R. Heffner, Celina, $94,-128—4.064 mi. Fayette Co. and 1.429 mi. Madison Co., to Stellhorn & Beightler, 2061 Fairfax Rd., Columbus, $96,348 and $33,807 respectively—6.754 mi. Geauga Co., to Clements-Orr Co., 5 East Long St., Columbus, $204,777—2.681 mi. Belmont Co., to Lewis & Copeland Constr. Co., Lima, $142,870 — 2.586 mi. Columbiana Co., to H. M. Bates, Steubenville, $57,447 — 6.4 mi. Shelby Co., to Churchill Constr. Co., Lima, $121,870 — traffic bound macadam paving 0.55 mi. Guernsey Co., to E. L. Paul, Zanesville, $9,556—widening, concrete resurfacing 1.665 mi. Sect. O, Akron-Youngstown Rd., and 2.191 mi. Sect. N, same road, Mahoning Co., to E. C. Radebaugh & Sons, 4176 Riverside Dr., Columbus, $71,900 and $113,870 respectively — bituminous macadam widening 1.686 mi. Franklin Co., to Cleveland-Trinidad Paving Co., Grant Theatre Bldg., Columbus, $36,831 — brick paving, incl. furnishing, delivering brick 0.832 mi. Lucas and Wood Counties, to McKechnie-Pierce Co., 112 East Woodruff St., Toledo, $62,871—brick paving 0.743 mi. Carroll Co., to Hill & Hill Co., Elyria, $53,579—relocating, crushed gravel paving 1.269 mi. Pickaway Co., to J. W. Bartels, Inc., Dayton, $13,632 — brick on concrete widening 2.416 mi. Montgomery Co., to C. Crampton, Dayton, $44,192—bituminous macadam paving 3.188 mi. Greene Co., to Republic Asphalt Paving Co., North Summit St., and Pennsylvania R.R., tracks, Dayton, $64,207—3.161 mi. Erie Co., to Nixon Constr. Co., Bowling Green, $72,110—7.855 mi. Seneca Co., to C. M. Gray, Waterville, $136,180—concrete curbing, waterbound macadam resurfacing 10.43 mi. Fayette Co., to H. M. Curray & Co., Eaton, $56,482. Grand total $1,756,990. Noted Apr. 16.

O., Cleveland—Grading, drainage structures, curbing brick paving Clinton Ave., to Roehl Bros., 7002 Denison Ave., $43,235; East 106th St., to Gould Constr. Co., 16113 Saranac Rd., $7,072.

O., Cleveland—Cuyahoga Co., concrete paving Sects. 5 and 6, Hilliard Rd., to N. Seigel, Western Reserve Bldg., $124,791 and $107,030 respectively. Noted Apr. 16.

O., Columbus—Franklin Co., F. D. Conally, clk., grading, draining, bituminous macadam paving 2.495 mi. Fuller Rd., Perry Twp., to N. B. Putnam Co., $36,746; grading, draining waterbound macadam paving 0.3 mi. Rutter Rd., Blendon Twp., to J. and L. Snauffer, Columbus, $4,011.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage structures 8.59 mi. State Hy. 18, Murray Co., to D. C. Sampley, Sulphur, $39,-721, est. $45,000; grading, paving 0.23 mi. approaches to new bridge over Cimarron River, U. S. Rd. 77, Logan Co., to J. J. Harrison, Holdenville, $19,652, est. $25,000, both 32 ft. wide.

Oklahoma—State Hy. Dpt., Oklahoma City, gravel top surfacing 9,210 cu.yd. State Aid Project 331, U. S. Hy. 64, west of Forgan, Beaver Co., to Crushed Rock Contg. Co., Durant, $18,850. Est. $25,000.

Okla., Oklahoma City — Bd. P. Wks., City Hall, grading, concrete paving 16,000 sq.yd. Denniston Park Addition, to Earl W. Baker & Co., 247 Southwest 21st St., $53,838. Est. $56,000.

Oregon—State Hy. Comn., Salem, grading 6.41 mi. Umatilla Co., to Portland Sand & Gravel Co., Sec. Line Rd., Portland, $56,750—5.31 mi. Umatilla Co., to A. D. Wolfe, Washougal, Wash., $83,362—2.75 mi. Tillamook Co., to R. L. Houck, Independence, $45,795—11.53 mi. Lincoln Co., to Berke Bros., Portland, $52,744—4.4 mi. Clackamas Co., to Kern & Kibbe, 290 East Salmon St., Portland, $40,590—2.08 mi. Klamath Co., to L. DeWitt, Wood Lake, Colo., $32,096—3.7 mi. Douglas Co., to Elliott & Kidd, Eugene, $37,100—3.25 mi. Clackamas Co., to Jacobson-Jensen Co., 407 Stanton St., Portland, $30,740. Grand total $379,177. Noted Apr. 23.

Constr. News page 219

Streets and Roads (Continued)

Pennsylvania—State Hy. Dpt., Harrisburg, grading, waterbound macadam surfacing 3.784 sq.yd. roads in Union Co., to Cox & Albridght, Hanover, $14,561—82,320 sq.yd. Bedford and Fulton Counties, to Paul Constr. Co., Cresson, $202,989—30,579 sq.yd. Chester Co., to York Eng. & Constr. Co., York, $55,877. Grand total $273,427. Noted Apr. 16.

Pa., Ambridge—A Johns, boro. mgr., 10th and Marchant Sts., grading, paving Melrose Ave. and 2 other streets, to Consumers' Coal & Supply Co., Ambridge, $27,182. Noted Apr. 9.

Pa., Ambridge—Boro, A. W. Johns, mgr., Boro Hall, grading, curbing, guttering, paving Lenz and Wilson Aves., to Consumers Coal & Supply Co., Ambridge, $17,138. Noted Apr. 9.

Pa., Erie—City Comn., concrete paving 3,834 ft. Old State Rd. from 34th St. to city line where state work stops, to M. A. McCormick, Inc., 1341 Liberty Ave.

Pa., Oil City—C. S. Hetrick, city clk., City Hall, grading, retaining wall, rein.-con. paving 5,923 sq.yd. North Main St. extension, to L. Schreck Co., Oil City, $27,037. Noted Apr. 30.

R. I., Newport—City, Street Dpt., rein.-con. paving Spring St. from Morton to Franklin Sts., to Callan Constr. Co., Bay View Ave., Bristol, $49,210.

Tex., Dallas—C. E. Gross, aud. Dallas Co., concrete paving Industrial Blvd. from Cadiz St. to Westmoreland Rd., to Uvalde Constr. Co., Santa Fe Bldg., $117,050. Noted Apr. 16.

Tex., Harlingen—For 8 in. graveling 14 mi. roads in Adams tract, 20 ft., near here, to Dodds & Wedegartner, San Benito, $35,000.

Tex., San Angelo—City, c/o Secretary, 6 in. rein.-con. paving 6 blocks North Main and Pulliam Sts., to L. E. Whitham & Co., 804 East 4th St., Austin, $44,779.

Utah—State Rd. Comn., Salt Lake City, grading, surfacing 7.427 mi. State Hy., Tooele Co., to J. B. and R. E. Walker, Deseret Bank Bldg., Salt Lake City, $51,000. Est. $66,879.

Utah—State Rd. Comn., Salt Lake City, oil processing (road mix) 41 mi. roads in Juab, Millard, Beaver and Iron Counties, to J. C. Compton, McMinnville, Ore., $48,090. Noted Apr. 30.

Utah—State Hy. Comn., Salt Lake City, grading, surfacing 6.893 mi. Uintah Co., to W. W. Clyde & J. W. Whiting, Springville, $79,528. Est. $101,000. Noted May 7.

Washington—State Hy. Dpt., Olympia, improving 2.207 mi. Yakima-Union Gap Rd., F.A.P. 132-J, Yakima Co., to Midstate Constr. Co., Box 33, Yakima, $80,400—2.022 mi. Colfax Rd. N., Whitman Co., to Colonial Building Co., 205 Hutton Bldg., Spokane, $59,764—3.03 mi. Peshastin Creek-Cashmere Rd., Chelan Co., to Norris Bros., Bullington, $61,211—27.242 mi. Dry Creek—Summit Rd., Yakima and Klickitat Counties, to H. C. Rogers & Sons, Dayton, $46,685. Grand total $248,060.

Washington—S. J. Humes, dir. Hys., Olympia, improving 17.44 mi. Kittitas Co., to I. L. Young, 523 Henry Bldg., Portland, Ore., $103,292 — 4.856 mi. Lewis Co., to Hendricks & Co., Chehalis, $128,505—2.154 mi. Pacific Co., to Albertson & Cornell Bros. Inc., 1134 A St., Tacoma, $70,097. Grand total $301,894. Noted Apr. 23.

Wash., Chehalis—Lewis Co., improving Salzer Valley-Little Hanaford Rd., to E. B. Hubbard, Edmonds, $25,370. Est. $33,000.

Wash., Tacoma—Comrs. Pierce Co., paving 1.17 mi. Gig-Habro-Long Branch Hy., to Albertson & Cornell Bros., Inc., 1113½ A St., Tacoma, $25,850.

Wash., Yakima—Yakima Co., paving 2.25 mi. Permanent Hy. 51, Toppenish-Fort Rd., to Midstate Contg. Co., Yakima, $61,496. Noted Apr. 28.

West Virginia—State Hy. Comn., Charleston, to G. N. and O. J. Yoho, Cameron, improving Project 3478 Monongalia Co., $125,073 — to Georges Constr. Co., Uniontown, Projects 69 and 108, Braxton Co. $177,019—to R. F. Kirkham & Co., 1634 B Quarrier, Charleston, Projects 3181 and 3358-A and 3, Fayette and Nicholas Counties, $16,419 — to Fucey Bros., Weston, Project 180-A, Fayette Co., $48,478—to Southern Oil and Tar Co., Clay St. and River Rd., Louisville, Ky., Projects 3045 B and 3304, Monroe Co. $23,072—to C. V. Rector & Sons, Muncie, Ind., Projects 3266-D and 3342, Ritchie Co. $4,607—to Hardy Constr. Co., Project 3499, Morgan Co. $47,838—to R. B. Taylor Constr. Co., 1446 Levering St., Louisville, Ky., Projects 3148 and 3113, Barbour Co. $8,904, Projects 3225-B and C, Harrison Co. $13,846; Projects 3059, 3200 and 3264, Logan Co. $12,713; Projects 3318, 3188 and 4189, Wayne Co. $9,111—to Bristol Steel & Iron Wks., Bristol, Va., Conway Bridge 1236, Marion Co., $26,991. Grand total $514,071. To J. E. Combs, Huntington, wire rope guard rail in State Routes 15 and 17, Mason and Putnam Counties at $0.27 per ft.; to S. G. Polino, Fairmont, Route 16, Ritchie and Pleasants Counties, $0.259.

Wisconsin—State Hy. Comn. and Hy. Coms. Barron, Bayfield, and Douglas Counties, Superior, grading, graveling 8,800 cu.yd. Luck-Cumberland Rd. and grading, rubble paving 1,120 sq.yd. Brule-Iron River Rd., to J. R. McLean, Superior, $25,667 and $62,098 respectively; grading, concrete paving 3,472 sq.yd. Douglas Co., to V. Nelson, Superior, $7,762. Grand total $95,527. Noted Apr. 30.

Wisconsin—State Hy. Comn. and Hy. Coms. Buffalo and Vernon Counties, LaCrosse, crushed stone surfacing 13,000 cu.yd. Nelson-Alma Rd., to F. J. Balmer, Waterloo, $19,630—grading, concrete paving 14,543 sq.yd., LaCrosse-Coon Valley Rd., to Alfred Brown Co., Chippewa Falls, 41,198—grading, draining 5.654 mi. Nelson-Alma Rd., to Schultz-Bradshaw, Madison, $65,275. Grand total $126,103.

Wisconsin—State Hy. Comn. and Hy. Com. Dane Co., Madison, to Eucher & Wegner, Prairie du Chien, grading S.G.M. 12, S.T.H. 81, $2,100—to A. W. Gallagher & Son, Madison, S.G.M. 13, $1,908—to E. F. Gallagher, Oregon, C.G.M. 106, $1,364; Project 603-13, $2,631; Project 588-31, $2,224; Project 589-31, $2,108—to F. Kutzke, Brooklyn, Project 577-15, $3,627; Project 582-20, $2,845; Project 583-20, $4,521—to T. Ayen, Mount Horeb, Project 451-24, $4,573—to O. Saunders, Mount Horeb, graveling Project 451-24, $6,381; crushed rock surfacing Project 638-22, $4,032—to P. Berg, Cambridge, graveling Project 589-31, $1,401—to C. M. Straavalson, Madison, Project 611-32, $4,106—to G. Givlin, Madison, Project 525-33, $1,676; Project 613-33, $720; to W. Granberg, Blanchardsville, bridges on Project 33-31, Verona, $976; on Project 34-20, Montrose, $1,353; on Project 38-40, Primrose, $486—to G. Leek, Stoughton, Project 35-24, Primrose, $1,686; Project 39-31, Verona, $637. Grand total $51,355.

Wisconsin—State Hy. Comn. and Hy. Coms. Waupaca and Sheboygan Counties, Madison, grading, concrete paving 3.921 mi. Waupaca-Manawa Rd., to Simpson & Parker, Appleton, $128,044—concrete paving 19.86 mi. Sheboygan Falls-South Co. Line Rd., to Morris Martin Co., Berlin, $270,951—Van Dyne Overhead, Fond du Lac Co., to J. Rasmussen & Sons, Oshkosh, $35,306. Grand total $434,301.

Wis., Milwaukee—Dpt. P. Wks., to G. W. Hirth, Inc., 719 Chambers St., sidewalks on Wells St., $1,233—to N. Harris, 830 East Mason St., paving alley between North 2nd and 3rd Sts., $744; alley between South 28th and 29th Sts., $810—to W. F. Hunt, 757 North Bway., East Juneau St. $1,536; South Muskego Ave. $31,871; West Center St., $18,302; West Lisbon Ave., $15,332 to Czerwinski Constr. Co., West 16th and Morgan Sts., South Austin St. $29,518. Grand total $99,346. Noted Apr. 29.

Wyoming—State Hy. Comn., Cheyenne, grading, bridging, culverts 13.214 mi. Sheridan Co., to Peterson, Shirley & Gunther, 1411 W.O.W. Bldg., Omaha, Neb., $77,383 — 11.444 mi. Niobrara Co., to Western Bridge & Constr. Co., 3967 Leavenworth St., Omaha, Neb., $45,669—oil treating 23.641 mi. Douglas-Glendo Rd. and Orin-Lusk Rd., to W. A. Norris, Cheyenne, $31,490—42.18 mi. Green River-Lyman Rd. and penetration paving 21.8 mi. Lyman-Evanston Rd., to Stevens Bros. Constr. Co., 612 Endicott Bldg., St. Paul, Minn., $47,792—reconstructing and base course surfacing 12.317 mi. Sweetwater Co., to T. J. Tobin Constr. Co., Casper, $72,564—grading, bridging 17.388 mi. Lincoln Co., to Green River Lumber Co., Green River, $66,532. Grand total $341,430.

Ont., Brampton—Peel Co., 6 in. mixed macadam paving 3 mi. Erindale-Streetsville Rd., and 3 in. mixed macadam paving 2½ mi. hy. west of Brampton, to Standard Paving Cd. Ltd., Harbor Bldg., Toronto, $54,807 and $29,338 respectively.

Ont., Bridgeburg—City Council, concrete paving Jarvis and Brock Sts., to Godson Contg. Co., 203 Richmond St. W., Toronto. Est. $35,000.

Ont., Kitchener—C. C. Lips, city clk., City Hall, asphalt paving Wood St., 1,100 ft. 5 ft. sidewalks on Duke, Luella, Guelph and Andrew Sts., to A. Damman & Co., 202 Weber St. E.; asphalt paving Pine, Mary, Lydia, Park and Duke Sts., to Standard Paving Co., 107 St. David St. Total length of pavemnt, 5,225 ft. Est. $40,000.

Ont., L'Orignal—See "Bids Asked."

Ont., Toronto — Toronto and York Roads Comn., 57 Adelaide St. E., concrete paving 5 mi. Contr. 2-31, to A. E. Jupp Constr. Co., 170 Berkeley St., $88,000; surface treating 6.5 mi. Contr. 7-31 to Bituminous Spraying & Contg. Co. Ltd., Confederation Life Bldg. Est. $125,000. Noted Apr. 30.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Idaho and Oregon—J. B. Perrine, Twin Falls, Idaho, made application for 5,000 cu.ft. water from Snake River, to irrigate 250,000 acres in Owyhee Co., Idaho, and equal amount in Oregon, incl. two 100 mi. canals, laterals, 2 dams.

Indiana—Bd. Comrs. Rush and Henry Counties, dredging 16 mi. Flat Rock and Blue Rivers. $40,680. J. R. Leakey, Newcastle, aud.

Ind., Vincennes—Bd. Comrs. Knox Co., constructing Frank Shouse Ditch, incl. 100,000 cu.yd. excav. $25,000. G. Sandefer, Vincennes, engr.

Kan., Kansas City—Kaw Valley Drainage Bd. soon takes bids 6 ft. dike along Kaw River. E. L. Mason, 719 Osage Ave., pres.

Kan., Winfield—City, H. H. Hanlan, city clk., preliminary plans flood protection work, incl. rein.-con wall joined by earthen dike to protect property of Consolidated Flour Mills Co. Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

Mass., Barnstable—L. W. Jamerson, Centerville, 3 bulkheads, timber piles, Centerville River. $25,000.

N H., Hampton Beach—Town, L. C. Ring, chn. com., expending $60,000, new breakwater on North Shore.

N. J., Jersey City—Morris Basin Dry Docks Co., Foot Henderson St., drydocks addition, bulkheads, filling in land on Little Basin, foot Henderson St. $25,000 or more. Private plans.

Tex., Corpus Christi — See "Factories and Mills."

Tex., El Paso — City, flood control project $325,000 bond election soon for same. Address City Engineer.

Tex., El Paso—City, c/o Secretary, and El Paso Co., c/o Judge, surveys flood control in McKelligon and Rosemont Canyons. $225,000. H. G. Stacy, city engr. and J. W. Carter, co. engr., both in El Paso.

BIDS ASKED

Ind., Valparaiso — Bd. Comrs. Porter Co., bids about June 1, 20 mi. Dahl Ditch from La Crosse to Kankakee River. $35,000. W. E. Morthland, Valparaiso, engr.

Ind., Winchester—May 23, by Bd. Comrs. Randolph Co., constructing William Shocgney Ditch. $26,000. A. B. Purdy, Winchester, engr.

Kan., Arkansas City — See "Contracts Awarded."

Mo., New Madrid—Morrison Drainage Dist., bids about July 5, excavating 104,298 cu.yd., constructing bridges, culverts. W. E. Davis, Point Pleasant, engr.

Mo., New Madrid—Drainage Dist. 12, c/o W. E. Davis, dist. engr., Point Pleasant, bids about July 6, excavating 1,194,348 cu.yd., rebuilding 7 bridges.

N. J., Camden—June 3, by South Jersey Port Comn., 106 Market St., dredging at new Camden Marine Terminal on Delaware River, between Clinton and Pine Sts.; also furnishing, erecting fabric wire fence enclosing terminal. U. S. Jefferys, secy.

New York—June 2, by R. D. Hayes, comr. Canals & Waterways, Albany, dredging at Barge Canal Terminals, Gowanus Bay, Greenpoint, Halletts Cove, Mott Haven, New York. Contr. M-71, $35,030; adv. E. N.-R. May 21.

Okla., Oklahoma City — June 1, by B. E. Corrigan, clk. Oklahoma Co., 350,000 cu.yd. drainage work in Deep Fork Drainage Ditch 14. $38,000. R. S. James, Cotton Exch. Bldg., engr.

Pa., Erie—May 22, by H. L. Munger, dir. Streets, City Hall, concrete retaining wall on Mill Creek at Glenwod Park Ave. near Elliott Rd. $25,000. A. N. Aitken, City Hall, engr.

Ontario — May 26, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, dredging 280,000 cu.yd. sand and clay, Port Arthur and Fort William, incl. towing of plant to and from work.

Ont., Byng Inlet—May 26, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, dredging 33,900 cu.yd. sand, clay and gravel, incl. towing of plant to and from work. $15,000.

Ont., Hamilton — May 26, by N. Desjardins, secy. Dpt. P. Wks., Ottawa, Ont., dredging 235,000 cu.yd. clay, sand and mud, incl. towing of plant to and from work. $95,000.

CONTRACTS AWARDED

Ill., Chicago — Bd. Comrs. Lincoln Park, North Clark and Center Sts., placing sand fill along lake shore between Montrose and Foster Aves., to Construction Materials Corp., 33 North La Salle St., $3,062,000.

Kan., Arkansas City—City Comn., opening up drainage ditches north and south of Kansas Ave. to Walnut River, day labor. D. Lawhe, City Hall, engr.

Mass., Wareham—Town, seawall, Longwood Park, to J. H. Burke, 221 High St., Wareham; cement work, to H. Smith, East Wareham. Est. $25,000.

N. B., Beresford—Dpt. P. Wks., Ottawa, Ont., breakwater, to J. E. and D. P. Connolly, Bathurst, $46,334.

Bond Elections

Coming Bond Elections

Waterworks Impvts.—Kansas City, Mo., May 26. $3,500,000.

Sewers, Pumping Station and Equipment—Kansas City, Mo., May 26, $1,500,000.

Flood Control Work—Sacramento, Calif., American Flood Control Dist., $775,000.

Flood Control and Channel Impvt. — Kansas City, Mo., May 26, $2,000,000.

Incinerating Plant—Kansas City, Mo., May 26. $1,000,000.

Underpasses, Safety Islands, Street Signs — Kansas City, Mo., May 26, $200,000.

Airport—Kansas City, Mo., May 26, $500,000.

Stadium, Playground, Parks, etc.—Kansas City, Mo., May 26, $3,500,000.

Swimming Pool, Bath House, etc.—Nebraska City, Neb., June 2, $25,000.

Natural Gas Dist. System—Higginsville, Mo., June 2. $55,000.

City Hall, Police and Fire Stations, Auditorium —Kansas City, Mo., May 26, $9,500,000.

Hospitals — Kansas City, Mo., May 26, $2,000,000.

Bonds Voted

Waterworks and Sewerage System Impvts. — Brownsville, Tex., G. W. Rogers, engr., $150,000.

Schools—Tucson, Ariz., P. E. Fernald, city engr., $200,000.

High School—Geneseo, N. Y., $275,000.

Bonds Defeated

Schools—Springfield, Ill., $375,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ala., Mobile—DREDGING—U. S. Eng. 6,500,000 cu.yd. Mobile Bay Channel.

Constr. News page 220

Federal Government Work (Continued)

Calif., San Rafael—BOMBING BASE—Con. Q. M., c/o H. B. Nurse, in charge San Rafael, 3 year program, incl. 125 commissioned officers houses; 55 duplex houses for non-commissioned officers; five 2-story barracks, warehouses, shops. $5,000,000.

Ill., Chicago — APPRAISERS STORES — Treas. Dpt. at office Sup. Archt., plans by Nimmons, Carr & Wright, 333 North Michigan Ave., associated with Burnham Bros., 160 North LaSalle St., appraiser stores building, Canal, Clinton, Harrison and Polk Sts. $1,500,000.

Ind., Jefferson Depot—BOILER, etc.—Con. Q. M., installing boiler, railroad tie plates, emergency repairs to warehouse. $3,586.

Md., Edgewood—RETURN LINE—Con. Q. M., 700 ft. return line to central heating plant. $5,000.

Md., Fort Hoyle—BOILER—Con. Q. M., installing boiler in central heating plant. $8,000.

Md., Fort Meade—SEWAGE DISPOSAL—Con. Q. M., repairing sewage disposal system at Fort George F. Meade.

Mass., Boston — CHIMNEYS — Con. Q. M. Depot, repairing 2 brick chimneys. $1,900.

Mass., Brockton—POST OFFICE—Treas. Dpt. at office Sup. Archt., brick, stone. $400,000.

Michigan—DREDGING—U. S. Eng., Detroit, 67,000 cu.yd. Raisen River from Lake Erie to Monroe. $28,000.

Mich., Jackson—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by C. Allen, Jackson, 2 story, basement, brick, steel. $300,000.

Miss., Biloxi — DREDGING — U. S. Eng., Mobile, Ala., 6.5 mi. in Biloxi Harbor.

Miss., Lumberton — POST OFFICE — Treas. Dpt. at office Sup. Archt., sketches 2 story, concrete, brick. $60,000.

Neb., Fort Robinson—FENCE REPAIRS, etc. —Con. Q. M., Quartermaster Depot, repairing fences, stables. $5,000.

N. C., Fort Bragg—WATERMAIN—Con. Q. M., replacing wooden stave watermain. $6,000.

O., Cleveland—FOUNDATION PIERS—Superintendent Lighthouses, foundation piers, protection piling and boathouse, at Cleveland Lighthouse.

Tenn., Memphis—PILE DIKES—U. S. Eng., McCall Bldg., 37,700 lin.ft. peramble pile dikes in Mississippi River.

Tex., Camp Normoyle—POWER PLANT—Con. Q. M., Normoyle Depot, repairing power plant. $2,262.

Tex., El Paso—PRISON—Dpt. Justice soon takes bids 2 story, basement, brick, steel, near here. $400,000. Trost & Trost, Two Republics Bldg., El Paso, archts. Noted Dec. 25.

Tex., Fort Worth—POST OFFICE—Treas. Ppt. at office Sup. Archt., bids latter part of month, 3 story, 200 x 270 ft. post office, Front and Lancaster Sts. $1,245,000. Wyatt C. Hendrick, Inc., 1st Natl. Bank Bldg., archt. Noted Mar. 12.

Va., Fort Myer—STABLE, etc.—Con. Q. M., service detachment stable, erecting retaining wall. $4,000.

Wash., Vancouver—OFFICE—Pub. Rds., T. H. McDonald, ch. of Bureau, U. S. Office Building, at Vancouver Barracks. $135,000. **Maturity in summer.**

BIDS ASKED

Ark., Hot Springs—ROADS—See "Contracts Awarded."

Calif., Colorado—PAVING—May 28, by Con. Q.M., Rockwell Field, 4 in. concrete or 1 in. amiesite on 3 in. Colas macadam paving 91,700 sq.ft. in Area 1; and 162,000 sq.yd. oiling in Area 3, Rockwell Field.

Calif., Riverside—INCINERATOR, etc.—June 9, at office Con. Q. M., March Field, 1 incinerator; gas-water-sewerage and electrical connections for 61 buildings; roads walks, grading, curbing for March Field; adv. E. N.-R. May 21.

Delaware—GUARD FENCE—May 29, by U. S. Eng., Wilmington, 9,750 lin.ft. guard fence on Cheapeake & Delaware Canal, on south side dike at Reedy Point Bridge; adv. E. N.-R. May 21.

Del., Wilmington—MOORING DOLPHINS—May 28, by U. S. Eng., Wilmington, 15 mooring dolphins along Chesapeake and Delaware Canad; adv. E. N.-R. May 21.

Ga., Savannah—REMODELING, etc.—June 5, by Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Marine Hospital.

Ill., Cicero — POST OFFICE — June 5, by Treas. Dpt. at office Sup. Archt., U. S. Post Office.

Ind., Greenfield—POST OFFICE—June 12, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. May 21. Noted Jan. 1.

Ind., Indianapolis—NURSES HOME—June 9, by Vt. Bur., Arlington Bldg., nurses home at U. S. Veterans Hospital, Riverside Park.

Ia., Sioux City—DIKES—May 27, by U. S. Eng., 611 Insurance Exch. Bldg., 4,000 lin.ft. dikes in Missouri River at Sioux City Bend. Noted Apr. 23.

La., Mansfield—POST OFFICE—June 9, by Treas. Dpt. at office Sup. Archt., U. S. Post Office; adv. E. N.-R. May 21.

Me., Portland—COURT HOUSE—June 1, by Treas. Dpt. at office Sup. Archt., extending, remodeling (except elevators) U. S. Court House. Former bids rejected. Noted Mar. 26.

Mass., Hingham—ROAD—May 27, by Yards & Docks, oiling and resurfacing 3,900 sq.yd. roads at 1st Naval Dist., Navy Yard.

Mass., Taunton—DREDGING—June 15, by U. S. Eng., Providence, R. I., 323,600 cu.yd. in Taunton River; adv. E. N.-R. May 21. Noted May 7.

Mass., Winthrop—HOSPITAL—June 15, by Con. Q. M., 2 story, basement, brick, tile post hospital at Fort Banks. $220,000. Noted Apr. 16.

Mass., Woods Hole—PILING, etc.—May 27, by Superintendent of Lighthouses, 459 lin.ft. steel sheet piling bulkhead together with dredged back fill of 10,000 cu.yd. at Woods Hole Lighthouse Depot.

Michigan—DREDGING—June 12, by U. S. Eng., Detroit, dredging Angles 5 and 6, and Angles 6 and 7, West Neebish Channel, St. Mary's River; adv. E. N.-R. May 21.

Mississippi, Arkansas and Louisiana—EARTHWORK — June 10, by U. S. Eng., Box 667, Vicksburg, Miss., 13,388,000 cu.yd. earthwork on east and west banks of Missisippi River; adv. E. N.-R. May 21.

Miss., Lumberton—POST OFFICE—June 2, by Treas. Dpt., at office Sup. Archt., U. S. Post Office.

Neb., Winnebago—HOSPITAL—See "Contracts Awarded."

Nevada—ROAD—May 28, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, Calif., grading 3.125 mi. Sects. C and D, Route 1, Lake Tahoe Natl. Forest Hy., Washoe Co.; 4.164 mi. Sect. D, Route 3, Glenbrook Natl. Forest, Douglas Co.

N. C., Fort Bragg—HOSPITAL—June 2, by Con. Q. M., hospital.

Okla., Shawnee—INFIRMARY—May 26, at office C. J. Rhoads, comr. Indian Affairs, Dpt. Agriculture, 2 story, part basement, 43 x 128 ft., rein.-con., brick, stone-infirmary and sanitorium. $75,000. Private plans. Noted Apr. 2.

Tenn., Memphis — CEMENT — June 11, by U. S. Eng., 240,000 bbl. portland cement for flood control work during next year.

Tennessee and Mississippi—ROAD—June 12, at office Con. Q. M., 1225 James Bldg., Chattanooga, Tenn., road from Shiloh Natl. Park, Tenn., to Corinth, Miss.; adv. E. N.-R. May 21.

Tex., Houston—POST OFFICE, etc.—June 16, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office and Court House.

Vt., Rutland—POST OFFICE, etc.—June 1, by Treas. Dpt. at office Sup. Archt., U. S. Post Office, Court House (except elevator). Former bids rejected. Noted Mar. 26.

Va., Langley Field—FILLING, etc.—June 11, at office Con. Q. M., Fort Monroe, filling, grading, Langley Field; adv. E. N.-R. May 21.

Va., Langley Field—HANGARS—June 15, at office Con. Q. M., Fort Monroe, 11 air corps hangars, annexes, connecting bays, boiler houses, at Langley Field; adv. E. N.-R. May 21.

Va., Lynchburg—POST OFFICE—May 28, by Treas. Dpt. at office Sup. Archt., remodeling building (old municipal building), for U. S. Post Office; adv. E. N.-R. May 21.

W. Va., Huntington—HOSPITAL—June 23, by Vet. Bu., Arlington Bldg., buildings, utilities, roads, walks, etc. for U. S. Veterans' Hospital; adv. E. N.-R. May 21.

Wyoming—ROAD—May 26, by Pub. Rds., Denver, Colo., grading, surfacing 8.574 mi. Hoback Canyon Natl. Forest Rd., Teton Natl. Forest, Teton Co. A. E. Palen, Custom House Bldg., Denver, dist. engr.

T. H., Pearl Harbor — TRAINING TANK — June 17, by Yards & Docks, Navy Dpt., submarine escape training tank at Naval Operating Base. Noted Feb. 19.

CONTRACTS AWARDED

Ark., Hot Springs—ROADS—Dpt. Agriculture, Forest Serv., constructing repairing roads in Ouachita National Forest, Garland and Montgomery Counties, by force account.

Ark., Old Town—LEVEE EARTHWORK—U. S. Eng., Memphis, Tenn., 1,200,000 cu.-yd. levee, earthwork near here, to Canal Constr. Co., McCall Bldg., Memphis, Tenn., $326,400.

California — ROAD — C. H. Sweetser, dist. engr., 461 Market St., San Francisco, grading 9.913 mi. Siskiyou Co., to Dunn & Baker, Klamath Falls, Ore., $73,934. Noted Apr. 2.

Calif., San Francisco—QUARTERS—Con. Q. M., Fort Mason, general contract fifteen seats double officers' quarters, to F. J. Reilly, 3650 Fulton St., $170,261; plumbing, to F. J. Klimm, 456 Ellis St., $15,946; electrical work, to G. Armstrong, 2990 Howard St., $5,169. Grand total $191,376. Noted Apr. 9.

Conn., Hartford—DREDGING—U. S. Eng., Providence, R. I. dredging Connecticut River, to J. P. Randerson, 755 Madison Ave., Albany, N. Y., at $0.31 per cu.yd. Noted Apr. 30.

Conn., Milford—POST OFFICE—Treas., Dpt. at office Sup. Archt., U. S. Post Office, to E. and F. Constr. Co., 78 Wells St., Bridgeport, $84,442. Noted Apr. 9.

Idaho—ROAD—Dpt. Agriculture., Pub. Rds., Ogden, grading 3.68 mi. Boundary Co., to W. L. Geist, St. Maries, $43,558, est. $60,185; 7.48 mi. Custer Co., to W. H. Puckett, Boise, $81,373, est. $110,282. Noted Apr. 30.

Idaho—ROADS—Pub. Rds., Ogden, Utah, improving North Pacific Hy., Coeur d'Alene Natl. Forest, Kootenai Co., to S. Orino, Realty Bldg., Spokane, Wash., $112,552 est. $144,893; 6.227 mi. North and South Hy. St. Joe Natl. Forest, Latah Co., to Morrison-Knudsen Co., 319 Bway., Idaho, $92,724 est. $122,139. Noted Apr. 23.

Idaho—ROAD—Pub. Rds., Ogden, Utah, grading, surfacing 7.93 mi. National Forest Rd., Pend Oreille Natl. Forest, Bonner Co., to H. R. Douglas, Kalispell, Mont., $24,688. Est $37,476. Noted Apr. 24.

Mass., Springfield—BOILER PLANT EQUIPMENT—Con. Q. M., Springfield Armory, boiler plant equipment, alterations, incl. oil burner, dusting apparatus, Hill Shops, to A. D. Granger Co., Inc., 15 Park Row, New York, $72,444. Noted May 7.

Mich., Sault Ste. Marie — WAREHOUSE — U. E. Eng. Detroit, brick, stone, rein.-con. warehouse, to Merritt, Chapman & Whitney Corp., Alsworth Bldg., Duluth, Minn., $84,000. Noted Mar. 26.

Mississippi—LEVEE EARTHWORK — U. S. Eng., Memphis, Tenn., 900,000 cu.yd. levee earthwork, near Sheard, to L. A. Wilson, Ottawa, Ill., $220,400; 2,550,000 cu.yd. near Lake Cormorant, to Brooks Callaway Co., Healey Bldg., Atlanta, Ga., $344,250.

Missouri — LEVEE EARTHWORK — U. S. Eng., Memphis, Tenn., 200,000 cu.yd. levee earthwork near Birds Point, to J. J. McCaughy Co., 205 West Wacker Dr., Chicago, Ill., $34,800.

Neb., Norfolk — EXTENDING, etc. — Treas. Dpt. at office Sup. Archt. extending, remodeling post office and court house to Tapager Constr. Co., Albert Lea, Minn., $122,646. Noted Apr. 16.

Neb., Winnebago—HOSPITAL—Dpt. Indian Affairs, 1 story, 46 x 60 x 230 ft. hospital, nurses' quarters, tuberculosis division, day labor. Est. $150,000.

Nevada—ROAD—C. H. Sweetser, dist. engr. Pub. Rds., San Francisco, Calif., grading 4.382 mi. Midland Trail, Ely-Tonapah Sect. and 5.238 mi. Midland Trail, Ely-Holt Creek Natl. Forest Sect., both White Pine Co., to W. K. McMillan, 2088 Howard St., San Francisco, Calif., $32,315 and $48,331 respectively. Noted Apr. 30.

Oregon—ROAD—Pub. Rds., Portland, grading 5.17 mi. Crater Lake Rd., Crater Lake Natl. Park, Jackson Co., 16 and 18 ft., to C. Young, Oakland, Calif., $84,608.

R. I., Newport—HEATING, etc.—Yards & Docks, Navy Dpt., heating and plumbing for Naval Hospital, to J. H. Larkin, Inc., 206 Cory Rd., Brookline; electrical work, to M. M. Hochman Electric Co., New Industrial Trust Bldg., Providence, R. I. Noted Mar. 19.

Utah—ROAD—Pub. Rds., Ogden, grading, surfacing roadbed 4.66 mi. Cache Co., to O. Nelson, Logan, $159,570. Est. $197,251. Noted May 1 Daily.

Washington—ROAD—Pub. Rds., Post Office, Portland, Ore., grading 2.481 mi. road in Pierce Co., 16 ft., to Rumsey & Co., Seattle, $140,929.

Wis., Ashland — REMODELING, etc.—Treas. Dpt. at office Sup. Archt., remodeling, extending U. S. Post Office, to Smith Constr. Co., 311 Builders Exch. Bldg., Duluth, Minn., $19,400. Noted Apr. 9.

FEDERAL POWER COMMISSION

Applications for License and Permits Licenses

1161—California Oregon Power Co., 58 Sutter St., San Francisco, Calif., wants preliminary permit power project on Klamath River, on public lands in Siskiyou Co.

1162 — Northwestern Herring Co., Everett, Wash., wants license constructed power project on unnamed stream at head of Port Conclusion, Baranof Island, within Tongass Natl. Forest, Alaska.

RAILWAYS

BIDS ASKED

Washington—See "Streets and Roads, under Seattle, Wash."

CONTRACTS AWARDED

West Virginia—Chesapeake & Ohio Ry. Co., Richmond, Va., C. W. Johns, ch. engr., Second Creek Tunnel, 2,160 ft. long, 32 ft. wide, 22 ft. high, concrete lined, double track, Manns Tunnel, 1,060 ft. long, 18 ft. wide, 22 ft. high, concrete lined, single track, on north side present tunnel west of Fort Springs, also five 100 ft. span steel deck girder bridge over Greenbrier River, to Boxley Bros. Co., Inc., Orange, Va. Est. $1,564,500.

SUBWAYS AND TUNNELS

CONTRACTS AWARDED

New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, track and contact rail for Route 101, part Sect. 1, Route 109, part Sect. 1, Sects. 2, 2a, 3 and part Sect. 4, Rapid Transit Railroad, Manhattan and Brooklyn Boros, to T. H. Reynolds Contr. Co., 98 Park Pl., New York, $397,600. Noted Apr. 9.

West Virginia—See "Railways."

GRADE CROSSINGS

PROPOSED WORK

Mo., St. Louis—See "Bids Asked."

N. Y., Valley Stream—Long Island R.R. Co., A. C. Watson, ch. engr., Pennsylvania Sta., New York, plans eliminating Merrick Road Crossing. $482,400. General and separate contract bids later.

Constr. News page 221

Grade Crossings (Continued)

BIDS ASKED

California—See "Streets and Roads."

Mo., St. Louis—June 2, by Bd. P. Serv., City Hall, rein.-con. tile lined pedestrian underpass on south side Market St. under 12th Blvd. $20,000; also bids later underpass on east side 12th Blvd. under Market St., $20,000. L. R. Bowen, city engr.

CONTRACTS AWARDED

N. Y., Buffalo—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, eliminating Starin Avenue Crossing, to Hecker-Moon Co., Canal and West 3rd Sts., Cleveland, O., $47,111. Est. $77,053. Noted Dec. 5, 1929.

N. Y., Veteran—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., reconstructing bridge carrying tracks over Horseheads-Monteur Falls State Hy. and constructing approaches to new bridge to G. D'Angelo Co., Peoples Trust Bldg., Binghamton, $71,168. Noted Sept. 18.

Wisconsin—State Hy. and Unemployment Comns., Madison, to Wisconsin Bridge & Iron Co., 5023 35th St., Milwaukee, Howell Overhead, Racine Co., $26,492; to G. W. Hirth, 729 West Chambers St., Milwaukee, Lien Overhead, Walworth Co., $12,817; to W. J. Sweeney, Green Bay, West Hayton Overhead, Calumet Co., $16,672; to Eau Claire Eng. Co., Eau Claire, Madison Overhead, Dane Co., $42,982; to Jacobus & Winding, Wauwatosa, Burlington Overhead, Racine Co. $16,209, Genz Overhead Kenosha Co. $13,485, Truesdale Overhead, Kenosha Co., $61,997; to H. C. Brogan, Milwaukee, Ryan Overhead, $90,813—to Simpson & Parker, Appleton, East Forest Junction Overhead, Calumet Co., $13,737; to Coddington Eng. Co., 290 3rd St., Milwaukee, Lovers Lane Overhead, Milwaukee Co., $82,975. Grand total $378,179.

Wisconsin—State Hy. and Unemployment Comns., Madison, Cedar Grove Overhead, Sheboygan Co., to C. R. Meyer & Sons, Oshkosh, $18,675; Barker Overhead, Rock Co., to Eau Claire Eng. Co., Eau Claire, $59,594; Hager City Overhead, to J. E. Hinman & Son, Glenwood City, $17,723. Grand total $95,992.

Wisconsin — State Hy. & Unemployment Comns., Madison, Monegan Overhead, to T. J. Malzahn & Sons, LaCrosse, $30,316; Minong Overhead, to J. E. Hinman & Son, Glenwood City, $32,643.

DAMS

PROPOSED WORK

N. J., Newark—See "Waterworks."

Okla., Tulsa—See "Waterworks."

BIDS ASKED

Md., Cumberland—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

Calif., Long Beach — PLEASURE PIER — Neptune Pier Co., Silver Spray Pier, plans Silver Spray Pleasure Pier, 1,464 ft. long, 46 ft. wide, solid fill type, incl. 60,000 tons rock, 650,000 cu.yd. hydraulic fill, 2,000 tons steel, 9,000 cu.yd. concrete, 70,000 lin.ft. wood piling, $1,000,000. R. D. Van Alstine, 410 East 9th St., engr. Noted Oct. 31, 1929.

La., Lake Charles—WHARVES—City and Harbor Dist., 1,600 ft. creosoted pile, timber wharf 201 ft. wide with 100 ft. creosoted piles at front, back half 101 ft. wide on sand fill with retaining wall in rear; 160 x 700 ft. steel wharf sheds with 200 ft. open wharf space between each shed, front apron 31 ft. wide with 2 tracks and 2 depressed tracks in rear. F. Shutts & Sons, Lake Charles, engrs.

New Jersey—PIERS—New Jersey State Bd. Commerce & Navigation, Court House, Trenton, and 1 Exchange Pl., Jersey City, pier construction and extensions, 16th St., Hoboken, and Vreeland Terrace, Edgewater. To exceed $20,000,000. **Maturity indefinite.**

N. Y., New York—PIERS—Dpt. Docks, Pier "A," Battery Pl., four 175 x 1,100 ft. piers, one each at West 48th, West 52nd, West 54th and West 56th Sts.; 775 x 100 ft. pier at West 56th St. Bids latter part August for rock excav., sidewall piling. $7,500,000. Noted Feb. 26.

BIDS ASKED

Calif., Los Angeles—WHARF DECK, etc.—May 27, by Los Angeles City Harbor Dpt., 1012 x 36 ft. rein.-con. wharf deck, 1,100 lin.ft. concrete retaining walls of various heights at Berths 144 and 146.

CONTRACTS AWARDED

N. Y., New York—PIER—Dpt. Docks, Pier "A", Battery Pl., pier foot East 110th St. and Harlem River, Contr. 2039, to J. Rich Steers, 17 Battery Pl., $32,382.

N. Y., New York—PIER—M. Cosgrove, comr. Docks, Pier "A", Battery Pl., reconstructing pier, foot East 30th St., Contr. 2037, to Rhodes & Manvel, Inc., 90 West St., $38,546. Noted Apr. 15.

Que., Ste. Felicite—WHARF—Dpt. P. Wks., Ottawa, Ont., wharf addition, to Ludger Lemieux Ltd., Ste. Marie Beauce, $29,953.

Constr. News page 222

AIRPORTS

PROPOSED WORK

Ill., Chicago—Thompson Aeronautical Corp., 5108 West 63rd St., plans by Roberts-Wright Co., engrs. and archts., Swetland Bldg., Cleveland, 1 story, 60 x 140 ft. brick, steel hangar, at airport. $75,000.

Tex., Del Rio—Magnolia Petroleum Co., 227 Bway., San Antonio, and Magnolia Bldg., Dallas, preliminary surveys airport equipped for night landings, constructing steel hangars, 8 to 10 plane capacity.

BIDS ASKED

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., N. F. Brown, dir. P. W., taking bids lighting at Municipal Airport, $65,000; gasoline storage and distribution, incl. 8 fueling pits for planes, $35,000; sanitary sewers, $9,500.

CONTRACTS AWARDED

Calif., Burbank—United Airports Co. of California, Ltd., 30 x 240 ft. machine shop at airport, to Austin Co. of California, 1626 Cardova St., Los Angeles. Western Air Express, lessee.

GRAIN ELEVATORS

PROPOSED WORK

Mo., Kansas City — GRAIN ELEVATOR — Kansas City Southern R.R. Co., A. N. Reece, ch. engr., 11th and Wyandotte Sts. and Norris Grain Co., lessee, F. C. Hoose, vice-pres., Bd. Trade Bldg., Kansas City, soon let contract grain elevator addition, Northeast Industrial Dist. Horner & Wyatt, 468 Bd. Trade Bldg., Kansas City, consult. engrs.

CONTRACTS AWARDED

Kan., Great Bend — GRAIN ELEVATOR — Barton County Flour Mills Co., 150,000 bu. rein.-con. addition, incl. 6 storage bins 2,500 bu. hopper scale, to Jones-Hettlesater Constr. Co., 600 Mutual Bldg., Kansas City, Mo.

Kan., Wellington — GRAIN ELEVATOR — Larabee Flour Mills Co., C. N. Arnold, mgr., repairing elevator damaged by fire, to McKenzie & Haig, 422 Corn Exch. Bldg., Minneapolis, Minn.

Neb., Omaha—TERMINAL ELEVATOR—Cargill Elevator Co., New Chamber of Commerce Bldg., Minneapolis, Minn., 5,000,000 bu. rein.-con., near here, to Fegles Constr. Co., 711 Wesley Temple Bldg., Minneapolis, Minn.

POWER AND LIGHTING

PROPOSED WORK

Missouri — Ozark Distributing Co., Dwight Bldg., Kansas City, preliminary plans natural gas distribution system in Alma, Blackburn, Emma, Waverly. Private plans.

Tex., Rio Grande City—Rio Grande Pub. Serv. Co., c/o F. A. Hornaday, Rio Grande City, laying 8 mi. gas pipe line from Los Olmos Oil & Gas Co., well to here. Private plans.

Ont., Oshawa—Ontario Shore Gas Co., extending gas mains, 8 mi. to Bowmanville and 3¼ mi. to Whitby. $100,000. Private plans. Noted May 14.

BIDS ASKED

N. Y., New York—May 26, by E. P. Mulrooney, police comr., 240 Centre St., electrical control equipment, optical systems and for bronze traffic signal posts, lead covered cable, removing existing Type C posts along 5th Ave., from Washington Sq. N. to 59th St.; installing traffic signal posts, lanterns, control boxes, lead covered cable, and removing existing Milliken type standards in Central Park, Manhattan Boro.

Pa., Pittsburgh—See "Airports."

CONTRACTS AWARDED

Okla., Guthrie — Western Service Corp., Braniff Bldg., Oklahoma City, 45 mi. 2- to 8-in. mains in natural gas distribution system, to Bensen & Henderson, Herskowitz Bldg., Oklahoma City, $227,000. Est. $250,000. Noted Apr. 9, under "Guthrie Center."

PARKS AND SPORTS

PROPOSED WORK

Ill., Ottawa—See "Schools."

Mass., Boston—City, Park Dpt., 33 Beacon St., stadium, incl. football field, baseball and soccer fields, tennis courts, Dunbar Ave., near Dorchester High School for Boys, Dorchester. $100,000. J. J. Murphy, Park Dpt., 33 Beacon St., engr.

N. J., Lyndhurst (br. Rutherford) — Bd. Town Comrs., Town Hall, municipal park rear of town hall. $25,000. **Maturity indefinite.** No appropriation available. Engineer not selected. Noted Apr. 9.

N. J., Rutherford—Bd. Educ., High School, athletic field, adjoining high school, incl. grading, sodding, concrete walk, running track. $25,000. **Maturity probably soon.**

N. J., Union City—Hudson Co. Park Comn., 921 Bergen Ave., Jersey City, concrete wading pool, installing playground equipment in Washington Park, Bergenline Ave. $35,000. C. N. Lowrie, 921 Bergen Ave., Jersey City, engr. Noted Apr. 9.

O., Cleveland—Cleveland Arena Corp., c/o T. Conner, archt., Hanna Bldg., sketches 1 story, 245 x 385 ft. sports arena, incl. natatorium, hockey, skating, polo, handball, dancing facilities, Euclid Ave. between East 30th and East 40th Sts. $3,500,000.

BIDS ASKED

N. J., Paterson—Bd. City Comrs., City Hall, bids about June 15, rein.-con. stadium, 7,500 seating capacity, Monument Heights. $100,000. Fanning & Shaw, 49 Ward St., Paterson, archts. Noted May 7.

N. Y., Brooklyn—May 26, by Park Bd. W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, constructing exit roadway in Prospect Park, adjacent to Park Circle, at Prospect Park southwest and Ocean Parkway; improving New Lots playground, Riverdale Ave., Sackman, Newport and Christopher Sts.; bituminous macadam paving Highland Park Dr.

N. Y., New York—May 26, by Parks Bd., W. R. Herrick, comr. Parks, Arsenal Bldg., Central Park, grand-stands in athletic field McComb's Dam Park, Bronx Boro.

Okla., Tulsa—May 25, by Clerk Tulsa Co., Court House, rein.-con., brick coliseum, plaza found., at County Fair Grounds. $200,000. Smith & Senter, 307 Philtower Bldg., archts. S. R. McClelland Court House, engr.

CONTRACTS AWARDED

Ind., Indianapolis — Indianapolis Baseball Club, W. Clauer, secy., 1235 West Washington St., rein.-con. baseball park 15,000 seating capacity, brick fence wall, West 16th St. near Riverside Park, to W. P. Jungclaus, 825 Mass Ave. Est. $350,000. Noted May 14.

Fla., Pensacola—Santi Rosa Island, Northwest Florida Bridge Corp., Pensacola, 2 story, 104 x 205 ft., storm proof casino, to Brackin Constr. Co., Merchants Natl. Bank Bldg., Mobile, Ala.

Mass., Arlington—Town, Park Comrs., grandstand, field improvements, Warren Pierce Field, near Mass. Ave., to J. L. Hammett Co., Kendall Sq., Cambridge. Est. $25,000. Noted Feb. 19.

Mass., Medford (br. Boston)—See "Schools."

O., Girard—Bd. Liberty Park, swimming pool, to J. H. Hanna & Son, Girard, $17,795 plumbing, to Edward P. Stroup Plumbing Co., Girard, $9,793. Noted Apr. 30.

HEATING AND VENTILATING

PROPOSED WORK

Mass., Waverly—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, soon takes bids improving 1 story, brick heating plant, incl. new turbine equipment, at W. E. Fernald State School. $60,000. E. C. Brown Co., 77 Summer St., Boston, engrs. Noted Aug. 21, under "Schools."

BIDS ASKED

Mass., Waverly—Commonwealth of Massachusetts, Dpt. Mental Diseases, taking bids new equipment for heating plant, incl. turbine, $60,000. Edw. C. Brown Co., 77 Summer St., Boston, engrs.

N. J., Clinton—May 29, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, 80 hp. boilers, underground service conduits at New Jersey Reformatory for Women. $25,000. Div. Architecture & Constr., State Office Bldg., Trenton, archts.

CONTRACTS AWARDED

N. J., Holmdel—Dpt. Institutions & Agencies, State Office Bldg., Trenton, heating and plumbing system in Reception & Treatment Hospital, to Burns, Lane & Richardson Co., 41 Adams Ave., Trenton, $72,487 and $83,971 respectively; electrical work, to A. Neri, 928 Washington St., Hoboken, $33,800; elevators, to Atlantic Elevator Co., Erie Ave., Phila., Pa., $13,660. Grand total $203,918.

R. I., Providence—New England Telephone & Telegraph Co., 245 State St., Boston, Mass., heating in exchange building, Broad St., to Taylor Heating Co., 714 Broad St.; plumbing, to Amer. Plumbing Co., 205 South Main St.; electrical work, to Electric Maintenance & Equipment Co., 339 Eddy St., all foregoing in Providence. Est. $25,000 or more. Noted Apr. 16, under "Buildings—Unclassified."

Wis., Milwaukee—Bd. School Directors, heating in Steuben Junior High School, to Stoehr & Landon, 1707 Clybourne Ave., $38,225; plumbing, to Dahl Plumbing Co., 1613 Stage St., $24,579; ventilating, to Stahl Wks., 1411 30th St., $28,771; dust collecting, to Downey Heating Co., 1729 St. Paul Ave., $550; heat regulators, to Natl. Regulating Co., 1007 Winnepago Ave., $9,888; elevators, to Staff Elevator Co., 817 Jackson St., $26,960; electrical work, to Andrae Electric Co., 2040 Clybourne Ave., $4,700. Grand total $133,673. Noted Jan. 22, under "Schools."

UNCLASSIFIED

PROPOSED WORK

Kentucky and Tennessee—PIPE LINE—Cities Serv. Corp., Marion E. Taylor Bldg., Louisville, Ky., surveys 80 mi. pipe line from southeastern Kentucky, probably Barbourville, to Knoxville, Tenn. Private plans.

Mass., Worcester—BUS TERMINAL—Union Bus Terminal Corp., c/o A. J. Smith, archt., 58 Front St., underground bus terminal, Salem Sq. To exceed $50,000.

N. Y., New York—COMFORT STATION—Dpt. Parks, W. R. Herrick, pres. Park Bd., Arsenal Bldg., Central Park, preliminary plans comfort station, Claremont Parkway and Webster Ave. $40,000. J. E. Kirby, 4179 Park Ave., archt.

Unclassified (Continued)

Okla., Oklahoma City—ELEVATORS—C. F. Colcord, Colcord Bldg., L. D. Callahan, mgr., 4 new high speed elevators for Colcord Building, $16,000. R. Porter, 1607 East 12th St., engr.

Texas and Oklahoma—GAS PIPE LINE—Panhandle Light & Power Co., c/o C. R. Stahl, mgr., Borger, Tex., 74 mi. gas pipe line between Dumas, Tex., and Boise City, Okla.

Texas—OIL PIPE LINE—Sun Oil Co., 1st Natl. Bank Bldg., Dallas and Marshall, oil pipe line from point in East Texas to coast. Private plans.

BIDS ASKED

Mass., Adams—WAR MEMORIAL TOWER—June 5, by Commonwealth of Massachusetts, War Memorial Comn., 11 Beacon St., Boston, granite, concrete war memorial tower on Mt. Greylock. Maginnis & Walsh, Statler Bldg., Boston, archts. Noted Oct. 16.

N. Y., Brooklyn—COMFORT STATION—May 26, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, comfort station, Ocean Ave. entrance to Prospect Park. Noted Jan. 8.

O., Cleveland—CULVERTS—May 22, by Bd. Comrs. Cuyahoga Co., concrete culverts on Chagrin River, 1,350 cu.yd. earth excav., 1,024 cu.yd. rein.-con., 136,870 lb. reinforcing, 490 sq.yd. waterproofing. $28,838. F. Williams, Court House, engr.

Tex., Fort Stockton—GAS PIPE LINE—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Kettleman Hills—PIPE LINE—Kettleman North Dome Assn., Ritchfield Oil Bldg., Los Angeles, pipe line extension, to Macco Constr. Co., 815 Ocean Ave., Clearwater, $35,000. Owner furnishes pipe.

Calif., Mayfield—MAUSOLEUM—Alta Mesa Impvt. Co., Arastradero Rd., rein.-con. mausoleum, 400 crypts, 3 rooms for columbarium, to Meese & Briggs, 1425 Bway., Burlingame, $150,000.

Ore., Portland—RADIO STATION—Oregonian Publishing Co., 135 6th St., 25 x 30 ft., rein.-con. radio station building, 2 steel towers each 300 ft. high, 33 mi. copper ground wire buried 10 in. in ground, to Kern & Kibbe, 290 East Salem St., $50,000.

Que., Montreal—ASPHALT PLANT—City, asphalt plant, to Watercress Co. Ltd., Montreal, $93,780.

Tex., Fort Stockton—GAS PIPE LINE—Big Bend Pipe Line Co., Fort Stockton, 22 mi. pipe line from company wells near here to city limits, own forces. $70,000. Private plans. Work started.

MATERIALS

PROPOSED WORK

CREOSOTED LUMBER—**Long Beach, Calif.**—City Harbor Dpt. rejected bids furnishing, delivering creosoted Douglas fir, rough, f.o.b. municipal Pier. Will readvertise.

BIDS ASKED

WATER and STEAM PIPING—**Kansas City, Kan.**—May 25, by City Clerk, water and steam piping, fitting, meters, also installation of same. To exceed $5,000. Burns & McDonnell Eng. Co., 401 Interstate Bldg., Kansas City, Mo., engrs.

GUARD RAIL—**Cleveland, O.**—May 26, by Bd. Cuyahoga Co., standard guard rail for roadways, $36,960. F. Williams, Court House, engr.

STEEL PIPE, etc.—**Vancouver, B. C.**—June 2, by City Council, 7,300 ft. 32 in. and 4,200 ft. 26 in. internal diam. rivetted steel or smoothbone pipe. $40,000. C. Brackenridge, City Hall, engr.

CONTRACTS AWARDED

CAST IRON PIPE — **Los Angeles, Calif.** — City Purchasing Agent, to National Cast Iron Pipe Co., 846 South Bway., 10,000 ft. 6 in. B and S c.i. pipe, delivery July 15, f.o.b. San Pedro, at $0.485 per ft.; to American Cast Iron Pipe Co., 412 West 6th St., 15,000 ft. 6 in. June 15 and 15,000 ft. 6 in. July 15, f.o.b. Slauson and Compton Ave., $0.47, 10,000 ft. 12 in. June 1 and 10,000 ft. 12 in. July 1, f.o.b. Van Nuys $1.60; to Pacific States Cast Iron Pipe Co., 417 South Hire St., 20,000 ft. 6 in. July 1, 20,000 ft. 6 in. Aug. 1, 20,000 ft. 6 in. Sept. 1, f.o.b. Hewitt, $0.505; to United States Pipe & Fdry. Co., 2326 East 8th St., 10,000 ft. 12 in. Aug. 1, f.o.b. Van Nuys, $1.66.

TAR PATCHING—**Hartford, Conn.**—City, Bd. Contr. & Supply, 20,000 gal. road tar cold patching and 50,000 gal. road tar hot patching, to Republic Creosoting Co., 1615 Merchant's Bank Bldg., Indianapolis, Ind., $11,470.

WATER PIPE—**Chicago, Ill.**—City, City Hall, furnishing delivering, distributing 535 tons 20 in. c.i. water pipe on various streets, to Glamorgan Pipe & Fdry. Co., 122 South Michigan Ave., at $40.90 per ton, total $21,882. Noted Apr. 9.

BITUMINOUS PATCHING MATERIAL — **Boston, Mass.** — Supply Dpt., bituminous patching material as specified to Trimount Oil Co., 1840 Parkway, Everett, $24,840.

STEEL RAILS—**St. Louis, Mo.**—Missouri, Pacific R.R. Co., E. A. Hadley, ch. engr., Missouri Pacific Bldg., 22,000 tons steel rails, to Colorado Fuel & Iron Co., Pueblo, Colo., to Illinois, Steel Co., 208 South La Salle St., Chicago, Ill., to Inland Steel Co., 33 South Dearborn St., Chicago, Ill., to Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TAR, etc.—**Lawrenceville, N. J.**—Lawrence Twp. Com., 30,000 gal. Grades A and B tar and 1,200 tons pea gravel, to Barrett Paving Co., Trenton Trust Bldg., Trenton, at $0.17 per gal. and $2.90 per ton respectively; paving Eldridge Ave., to Agabiti Bros., 125 Swan St., Trenton, $16,347.

ROAD OIL—**Wyckoff, N. J.**—Twp. Comn., Township Hall, 20,000 gal. road oil, to Union Building & Constr. Co., 150 Prospect St., Passaic, at $0.115 per gal.

ROAD GRAVEL, etc. — **Long Island City, N. Y.** — G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Hudson Road & Gravel Co., 10,000 cu.yd. road gravel, $10,666; to Colonial Sand & Gravel Co., Bridge Plaza, 15,000 cu.yd. broken stone, $99,400; to Standard Oil Co. of New York, 26 Bway., New York, 400,000 gal. macadam binder $36,000, 400,000 gal. fuel oil $18,680, 500,000 gal. asphalt macadam binder $21,250; to F. McIntyre, 60,000 cu.yd. steam ashes, $44,400. Grand total $230,396. Noted Apr. 16.

SAND, etc.—**Lang Island City, N. Y.**—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 20,000 cu.yd. sand, to W. J. Welch, 200 Madison Ave., New York, $17,600; 250,000 gal. calcium chloride, to Solvay Sales Corp., 61 Bway., New York, $15,875. Noted Apr. 23.

EQUIPMENT

PROPOSED WORK

ROAD STONE PLANT EQUIPMENT — **Bellefonte, Pa.**—Chemical Lime Co., Inc., new equipment, plant extension at Plant 2, on Bellefonte Central R.R. $200,000.

BIDS ASKED

TRACTOR—**Cambridge, Mass.**—P. O. Box 22, in market small caterpillar tractor, set of tracks for small Cletrac tractor.

BOILER—**Everett, Mass.**—Everett Factories Corp., 210 Bway., in market 15 hp. self contained, Scotch or locomotive type boiler, 50 lb. pressure, Mass. standard, about 8 ft. overall.

CENTRIFUGAL PUMPS — **Lynn, Mass.** — H. R. C., P. O. Box 304, in market two centrifugal pumps, 2, 2½ or 3 in., with or without motors.

GRADER—**Mora, Minn.**—May 26, by G. G. Billstron, aud. Kanabec Co., one 12 ft. blade grader, 8,000 lb., pull type, to be used with caterpillar tractor.

TURBINE CYLINDER, etc.—**Cleveland, O.**—May 29, by City, turbine cylinder for Allis Chalmers Turbine No. 3, power transformers, manhole rings and covers.

DUMP TRUCK—**Shaker Heights, O.**—May 28, by City, E. P. Rudolph, clk., one 5 ton dump truck.

CONTRACTS AWARDED

FUEL OIL TANKS—**Jacksonville, Fla.**—City Comn., two 40,000 bbl. fuel oil tanks, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa., $22,470.

FOREIGN

Germany, Misburg—Elwerath Gewerkschaft, Hanover, general contract steel oil refinery, steel, to Arthurg-McKee Co., 2422 Euclid Ave., Cleveland, O., $1,000,000.

Mexico, Villa Acuna, Coahuila—Acuna Broadcasting Co., Villa Acuna, Mexico, and R. M. Brinkley, Milford, Kan., plan 80,000 watt broadcasting station. $150,000. Two 300 ft. steel towers awarded to Busboon Bros., Fairbury, Neb.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Mass., Brighton—Owner, c/o Parker & Brown, archts., 51 Cornhill, Boston, taking bids two 2 story, basement, brick, stone, steel units, concrete founds., 23-27 Lanark Pl. $150,000.

Mass., Lynn — Hotel Lenox Inc., V. M. Kavanaugh, pres., 71 Spencer St., taking bids 3 story, basement, 90 x 140 ft., brick, steel hotel, plain found., Broad and Exchange Sts. To exceed $150,000. G. A. Cornet, 14 Central Ave., archt. Noted May 1 Daily.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Jackson Heights — See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., New Brighton (sta. Staten Island)—See "Contracts Awarded."

N. Y., New Rochelle—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., St. Albans—See "Contracts Awarded."

N. Y., Yonkers—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Chico—Hotel Oaks, brick, steel, rein.-con. addition to hotel, 2nd and Salem Sts., to J. L. McLaughlin, 251 Kearny St., San Francisco. Est. $150,000.

N. Y., Brooklyn—Kruchkow Bros., 4914 5th Ave., 6 story, 100 x 100 ft., 18th Ave. and 67th St., separate contracts. To exceed $250,000.

N. Y., Brooklyn — Superb Homes, Inc., J. Miller, pres., 3362 Fenton St., apartment Wilson and Givan Aves., separate contracts. $150,000. A. Farber, 16 Court St., archt.

N. Y., Jackson Heights—Jackson Terrace Homes, 31-13 30th Ave., Astoria, apartment, 91st St. and 30th Ave., separate contracts. $150,000. L. Bailey, 295 6th Ave., Astoria, archt.

N. Y., Jamaica—Chumar Holding Corp., 163-18 Jamaica Ave., apartment, 201st St. and 29th Ave., separate contracts. $150,000. G. Crane, 8711 114th St., Richmond Hill, archt.

N. Y., Jamaica—A. H. Cohen, 104-19 118th St., Laurelton, 4 story, 90th Ave. and East 172nd St., separate contracts. $150,000. P. Millman, 1004 Montgomery St., Brooklyn, archt.

N. Y., Jamaica—Olden Terrace Homes, 89-17 161st St., Jamaica, apartment, Furmanville Ave. and 82nd St., separate contracts. $350,000. C. Infanger, c/o owner, archt.

N. Y., Long Island City—Schizzana Realty Co., 39-24 112th St., Corona 4 story, 29th St. and 36th Ave., separate contracts. $150,000. C. Wuest, 32-02 30th St., Astoria, archt.

N. Y., New Brighton (sta. Staten Island—Daniel Low Terrace Corp., J. Black, pres., 29 Sherman St., Tottenville, 4 story, basement, 80 x 85 ft., brick, steel, Daniel Low Terrace, separate contracts. $150,000. M. S. Uslan, 57 Bay St., St. George, archt.

N. Y., New Rochelle—Center Gardens, Inc., and Rosedale Eng. Co., 1640 Westchester Ave., New York, 5 story, basement, Centre Ave. and Trinity Pl., separate contracts. $360,000. L. R. Uffner, 202 West 40th St., New York, archt.

N. Y., New York—Berger Ornity Building Co., 1775 Weeks Ave., 6 story, 98 x 100 ft., Eastern Blvd. and Buhre Ave., separate contracts. $165,000. I. L. Crausman, 332 East 149th St., archt.

N. Y., New York—Corporation, c/o C. F. Haring, 1834 Narraganselt Ave., apartment, Rhinelander and Tenbrook Ave., separate contracts. $160,000. B. H. Simonson, 3 Hillside Ave., Pelham, archt.

N. Y., New York—Epsal Realty Corp., A. Alexander, pres., 4375 Bway., 6 story, 80 x 180 ft., 22 Dongan Pl., separate contracts. $270,000. Becker & Levy, 349 East 149th St., archts.

N. Y., New York—Fordwin Bros., 1516 Nelson Ave., 6 story, basement, 84 x 150 ft., Gates Ave. and Mosholu Parkway, separate contracts. $250,000. Becker & Levy, 349 East 149th St., archts.

N. Y., New York—Improved Real Estate Corp., S. Minskoff, pres., 521 5th Ave., 6 story, 63 x 95 ft., Perry Ave. and Gun Hill Rd., separate contracts. $175,000. H. Ginsberg, 205 East 42nd St., archt.

N. Y., New York—S. Lavinsky, c/o M. Hirsch, archt., 350 Stone St., Brooklyn, apartments, Harrod Ave. and 174th St., separate contracts. $150,000.

N. Y., New York—Solkro Holding Corp., H. Solomon, pres., 4756 3rd Ave., 6 story, 103 x 112 ft., Minerva Pl. and Jerome Ave., separate contracts. $160,000. R. Gottlieb, 4753 3rd Ave., archt.

N. Y., New York—T. J. Waters, 971 Woodycrest Ave., 6 story, 50 x 115 ft., Mount Hope and Jerome Aves., separate contracts. $150,000. C. Kreymborg, 2534 Marion Ave., archt.

N. Y., New York—L. Wolf, 2305 University Ave., 6 story, 172nd St. and Nelson Ave., to Starwell Constr. Co., 2305 University Ave. Est. $150,000.

N. Y., St. Albans—Locust Manor Homes, Foch Blvd. and 171st St., apartment, separate contracts. $175,000. A. Allen, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., St. Albans—F. Richards, Ascan Ave., Forest Hills, apartment, Foch Blvd. and 218th St., separate contracts. $150,000. Private plans.

N. Y., St. Albans—Harrow Holding Corp., Murdock Ave. and 219th St., apartment, Murdock Ave. and 219th St., separate contracts. $300,000. Private plans.

N. Y., Yonkers—Bronx Road Associates, 40 East 49th St., 6 story apartment, Bronxville Rd. and Palmer Ave., separate contracts. $600,000. Private plans. Noted Apr. 23.

CLUBS

PROPOSED WORK

N. D., Fargo—El Zagel Holding Co., W. T. Johnson, secy., Masonic Temple, plans mosque, El Zagal Park. $200,000.

CONTRACTS AWARDED

Conn., Manchester—Manchester Y. M. C. A., W. A. Strickland, chn. building com., 2 story, basement, 75 x 75 ft. and 45 x 75 ft. Y. M. C. A. addition, community building library, to G. Schreiber, 285 West Center St., South Manchester, $151,000. Noted Apr. 9.

N. J., Orange—H. B. Marsh, archt., 7 East 48th St., general contract 3 story, basement, brick, steel building, to F. Kilgus, 13 South 6th St., Newark, for Y.M.C.A., 148 Central Pl. Est. $150,000. Noted Apr. 2.

HOSPITALS

PROPOSED WORK

Calif., Los Angeles—Santa Fe Ry. Co., Kerckhoff Bldg., 6 story, basement, rein.-con., 6th and St. Louis Sts. $300,000. Private plans.

Constr. News page 223

Hospitals (Continued)

Conn., Willimantic—St. Joseph's Hospital, 88 Jackson St., J. F. Carr, pres. trustees, takes bids in July or later, general contract hospital. Crow, Lewis & Wick, 200 5th Ave., New York, archts. Noted Mar. 5.

Ind., Logansport — Indiana Insane Hospital plans by W. Scholer, 210 Wallace Bldg., Lafayette, Logansport State Hospital, rein.-con. $225,000. S. Dodds, supt.

Me., Hebron — State, employees building at State of Maine Sanatorium. $150,000. Architect not selected.

Mass., Springfield—House of Providence Hospital, c/o J. W. Donahue, 1200 Main St., archt., plans altering and constructing, maternity building addition, Dwight St. $150,000 or more.

N. J., Hasbrouck Heights—Hasbrouck Heights Hospital, H. K. Cohan, supt., 272 Columbus Ave., 3 story, basement, 110 x 115 ft., brick, steel, Columbus Ave. $150,000. Raising funds. **Maturity in November.** J. D. Lugosch, 714 Bergenline Ave., Union City, archt. Noted Apr. 22.

N. J., Jersey City — Fairmount Private Hospital, O. R. Blanchard, chn. com., 136 Summit Ave., 8 story, basement, brick, steel $150,000. Project in abeyance. Raising funds. Architect not selected. Noted Mar. 5.

N. Y., Buffalo—Buffalo General Hospital, 100 High St., plans by Kidd & Kidd, 524 Franklin St., 4 story hospital wing and laboratory, $40,000. Noted July 10, 1930.

N. Y., New Dorp (sta. Staten Island)—Seaside Hospital rejected bids 3 story, basement, 50 x 150 ft., brick, steel dormitory. $200,000. **Maturity probably in October.** J. Whitford, 56 Bay St., St. George, archt. Noted May 1 Daily.

N. Y., New York—Beth Israel Hospital, 60 Jefferson St., altering and constructing hospital addition. $150,000. H. Hurwitt, 41 West 33rd St., archt. Project in abeyance until about Oct. 1. Noted Apr. 30.

Wash., Seattle—O. Weber, 1118 Alki Ave., plans steel, concrete natatorium, Duwamish Head St. $75,000-$100,000.

Ont., Orillia — Provincial Govt. of Ontario, D. I. M. Rabb, minister of health, Toronto, girls' dormitory at Hospital for Insane. $200,000.

Ont., Penetang—Provincial Govt. of Ontario, D. I. M. Rabb, minister of health, Toronto, hospital for criminal insane. $300,000.

Ont., Walkerville — Essex Border Utilities Comn., Canada Bldg., Windsor, preliminary sketches by Pennington & Boyde, Security Bldg., Windsor, 3 or 4 story, basement, brick, steel, concrete, stone, tubercular hospital, adjoining Metropolitan Hospital, Lens St. $200,000.

Que., St. Jerome—Special Com. of Citizens, A. Cherrier, secy.-treas., rein.-con., brick, terra cotta hospital. Raising funds. **Maturity about September.** Architect not selected.

BIDS ASKED

Ga., Waycross—May 25, by Bd. Comrs. Ware Co., P. N. Harley, Jr., chn., 3 story, basement, hospital. $150,000. R. Fetner, 32 West Forsythe St., Jacksonville, Fla., archt. Noted Mar. 5.

Mass., Northampton—May 28, by Commonwealth of Massachusetts, Dpt., Mental Diseases, 3 story, basement, 40 x 195 ft., brick, stone, steel male nurses home, plain found., at State Hospital, $150,000 or more; heating, est. $25,000; plumbing and electrical work, est. $25,000. G. Robb, 87 Beacon St., Boston, archt. A. B. Franklin, Inc., 25 Haverhill St., Boston, engrs. Noted May 7.

Pa., Erie—June 2, by Hamot Hospital, J. L. Sheppard in charge, 4 East 2nd St., New York (from selected list of builders) 6 story, basement, 43 x 87 ft., brick, tile, 2 East 2nd St., $200,000. Crow, Lewis & Wick, 200 5th Ave., New York archt. Noted May 7.

Vt., Barre—May 29, by Barre City Hospital, F. E. Langley, chn., Bd. Trustees, and Stevens & Lee, archts., 45 Newbury St., Boston, Mass., altering and constructing 2 story, basement, brick, concrete hospital addition, concrete found., 71 Washington St. $150,000. Noted July 31.

CONTRACTS AWARDED

Conn., Mansfield — State, Mansfield Training School, nurses' home, to Charles Smith & Sons, 750 Main St., Hartford, $128,000. Noted May 14.

N. H., Littleton — Littleton Hospital, H. M. Eaton, pres., 3 story, basement, 40 x 105 ft. and ell, brick, concrete hospital, power house, to Loukes & Clarke Corp., 6 Ernest St., Wallingford, Conn. Contractor now taking separate contract bids. Noted Apr. 9.

N. J., Clinton—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 3 story, basement, 50 x 120 ft., brick, steel hospital, reformatory for Women, to C. R. Hedden Co., 357 South Orange Ave., Newark; plumbing, to A. M. Maddox, 234 Watchung Ave., Montclair; heating, to Elling Bros., 336 North Grove St., Somerville; electrical work, to Broun Electric Co., 1215 South Broad St., Trenton. Est. $150,000. Noted Apr. 23.

N. J., New Brunswick — Maginnis & Walsh, archts., 100 Boylston St., Boston, Mass., general contract completing 5 story, 48 x 105 ft. main building, two 2 story, 45 x 110 ft. wings, to Rogers & Sons Constr. Co., 71 John St., New Brunswick, for St. Peters General Hospital, Easton Ave. Est. $200,000. Noted May 7.

N. Y., Farmingdale—Nassau-Suffolk County, Sanitarium, general contract sanitarium, to J. J. Dixon, Amityville, est. $300,000; cement tile and sheathing lumber, to Nassau-Suffolk Lumber & Supply Co., Amityville.

N. Y., West Haverstraw—Dpt. Standards & Purchase, Albany, general contract state reconstruction home, to Cross & Roberts, Inc., 122 East 42nd St., New York, $263,000; heating, to Ira Willner, Inc., 500 West 167th St., New York, $31,085; plumbing, to Nally Plumbing-Constr. Co., 55 West 42nd St., New York, $27,218; electrical work, to W. H. Straut, 37 Conger Ave., Haverstraw, $15,200. Grand total $336,503. Noted Feb. 26.

O., Cleveland—City, D. Morgan, mgr., 6 story, basement, 130 x 215 ft. tuberculosis pavilion, brick, steel, concrete, to Crowell & Little Constr. Co., Hanna Bldg., $522,000; steam heating, to Weiss Heating & Plumbing Co., 5064 Cedar St., $56,565. Noted Apr. 23.

Wis., Fond du Lac—Schmidt, Garden & Ericksen, archts., 104 South Michigan Ave., Chicago, Ill., 4 story, tunnel, brick, steel nurses home, for St. Agnes Hospital, to Immel Constr. Co., Fond du Lac; plumbing and heating, to J. Ahern, Fond du Lac. Est. $200,000. Noted Apr. 9.

CHURCHES

PROPOSED WORK

Okla., Oklahoma City—Episcopal Church of Oklahoma, 127 West 27th St., c/o T. Cassady, pastor, plans by Mayer, Murray & Phillips, 2 West 47th St., New York, cathedral, 63rd St. $1,000,000.

Pa., Williamsport — Mater Dolorosa Church, A. Manley, pastor, sketches by J. J. Howard, Scranton, 3 story, basement, rein.-con., steel church and school building, plain found., incl. auditorium, Park Ave. $250,000.

Tex., Amarillo—First Christian Congregational Church, c/o J. E. Hill, Amarillo, plans by A. F. Wickes, c/o Dpt. Church Erection, U. C. M. S., Mission Bldg., Indianapolis, Ind., church, 1301 Madison St. $350,000. Will select local associate architect soon. Noted Mar. 5.

Que., Quebec City — Franciscan Fathers, A. Stanislas, pastor, L'Alverne St., plans by P. Levesque, 115 St. John St., and takes bids about May 30, 3½ story, structural steel addition to monastery. $125,000-$150,000.

Ont., Toronto—St. John's Roman Catholic Church, Kingston Rd., plans by H. J. Chown, 20 Wayland Ave., 1 story, basement, 65 x 120 ft., and 100 ft. tower, brick, stone and timber church. $150,000.

BIDS ASKED

Mass., Arlington (br. Boston) — Church of Our Savior (Episcopal), W. N. Bixby, 38 Marathon St., pastor, taking bids 2 story, basement, irregular sized, brick, stone parish house, church tower, plain found., Marathon St. $150,000. C. C. Coveny, 184 Boylston St., Boston, archt. Noted Apr. 16.

Mass., Readville—St. John's Roman Catholic Church, D. R. Regan, pastor, taking bids altering and constructing 3 story, basement, brick, stone convent, plain found. $150,000. M. P. Meade, 80 Boylston St., Boston, archt.

N. J., Newark—Fanning & Shaw, archts., 49 Ward St., Paterson, taking bids general contract 4 story, brick, steel chancery building, 31 Mulberry St., for Roman Catholic Diocese, 22 Mulberry St. $150,000. Noted May 7.

N. J., Newark—W. B. Willis, archt., 111 Madison Ave., New York, bids about June 1, general contract rebuilding 2 story, basement, brick, steel church, James and Washington Sts., for Second Presbyterian Church, 294 Mount Prospect Ave. $250,000. Noted Mar. 19.

N. J., Nutley—May 23, by Latenser, Bastow & Way, archts., 15 East 40th St., New York, altering and constructing 2 story, basement, brick, steel convent addition, St. Mary's Pl., for St. Mary's Roman Catholic Church, St. Mary's Pl. $150,000. Noted Apr. 30.

N. Y., New York — May 25, by Paulist Fathers, J. B. Harney, pastor, 415 West 59th St., and Maginnis & Walsh, archts., Statler Bldg., Boston, Mass., 6 story, basement, 100 x 110 ft., steel, granite rectory, 415 West 59th St. To exceed $150,000.

CONTRACTS AWARDED

Conn., Hartford—St. Justin's Roman Catholic Parish, F. P. Nolan, pastor, 2 story, belfry, 60 x 150 ft., brick, marble, to Wise & Upson, 7 Forest St. Est. $400,000. Noted Apr. 30.

Ill., Chicago — Catholic Bishop of Chicago, 719 Rush St., masonry contract 1 story, 111 x 201 ft. church, 1,200 seating capacity, 1801 West 80th St., to J. B. McCabe, 7415 South Ashland Ave.; carpentry work, to L. O. McLorel, 845 West 50th St. Est. $100,000. Noted Apr. 2.

Ia., Des Moines — First Church of Christ Scientist, H. Rollins, member building com., general contract 1½ story, basement, 151 x 182 ft., concrete, brick, stone, to J. E. Sovejoy, 1118 Mulberry St. $138,723. Noted May 7.

Mich., Kalamazoo — First Baptist Church, West Michigan Ave., 4 story, basement, 47 x 100 ft., brick, steel, rein.-con., stone church and church house, plain found., West Michigan Ave., church house unit awarded to O. F. Miller Co., Kalamazoo. Total est. $205,000.

SCHOOLS

PROPOSED WORK

Calif., Los Angeles—Roman Catholic Bishop of Los Angeles and San Diego, plans by M. L. Barker & G. L. Ott, 3642 South LaBrea Ave., high school. To exceed $150,000.

Calif., Los Angeles—University of Southern California, 3551 University Ave., plans by Cram & Ferguson and L. E. Lunden, Rowan Bldg., 4 story, basement, 175 x 248 ft., brick fill wall, steel, library.

Ill., Oak Park—Bd. Educ. plans by Holmes & Flinn, 6 South Dearborn St., Chicago, 3 story, 70 x 105 ft. addition to Emerson School, incl. kindergarten, science rooms, Washington Blvd. and Clinton Ave., also addition another school. $225,000.

Ill., Ottawa — Township High School Bd. Educ. plans by Llewellyn & Llewellyn, 38 South Dearborn St., Chicago, 3 story, 130 x 156 ft. gymnasium and school rooms, part 1 and 3 story, 120 x 156 ft. school, incl. machine shop, automobile and carpenter shops. $300,000.

Ia., Charles City—Bd. Educ., Erwin Larson, secy., plans by Jacobson & Jacobson, 123 Grand St., Minneapolis, Minn., concrete, brick school. $250,000. This corrects report in May 7th issue, under Louisiana.

Ia., Iowa City—Bd. Educ., J. E. Stronks, 603 Johnson Savings Bank Bldg., sketches concrete, brick, stone high school. $600,000.

Kan., Wichita—Bd. Educ., L. Gerteis, secy., 406 York Rite Temple Bldg., soon takes bids College Hill Intermediate School, 3 story, 170 x 230 ft., concrete, brick, steel, stone, incl. gymnasium, auditorium, cafeteria. $235,000. E. Forsblom, Central Bldg., engr.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., soon lets contract 3 story, basement, brick, stone, steel astronomy building, plain found., between Concord Ave. and Garden St. Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., Boston, archts.

Mass., Dorchester (sta. Boston)—City of Boston, Dpt. School Buildings, revised plans by G. E. Robinson, 80 Federal St., Boston, 3 story, basement, girls' high school, brick, steel, limestone, granite, plain found., Geneva Ave. Christopher Gibson Dist. $1,400,000. Noted Mar. 27.

Mass., Waltham—City, Mayor's Office, City Hall, school, probably 2 story, basement, brick, stone, Appleton Park. $150,000 or more. Architect not selected.

Mass., West Roxbury (sta. Boston)—City of Boston, Dpt. School Buildings, plans by H. R. Duffee, 364 Belgrade Ave., Roslindale, and soon takes bids 2 story, basement, brick, lime stone school, plain found., Robert Gould Shaw Dist. $200,000. Noted Apr. 2.

Minn., Brackenridge—Bd. Educ. plans school. $150,000. **Maturity in 1932.**

N. H., Exeter—Phillips Exeter Academy, L. Perry, principal, and Cram & Ferguson, archts., 248 Boylston St., Boston, Mass., soon lets contract altering and constructing 3 brick dormitory additions, plain found., academy grounds. To exceed $150,000. Noted Nov. 27.

N. H., Nashua—City, W. G. Grant, chn. building comr., Junior High School, brick, steel, rein.-con., incl. gymnasium, Temple St. $250,000. Architect not selected.

N. J., Elizabeth — Bd. Educ., 417 South Broad St., revised sketches by H. B. Brady, Inc., 333 North Broad St., 2 story, basement, brick, steel, South St. $150,000. Noted Feb. 12.

N. J., Mahwah—Bd. Educ., E. C. Lane, chn. Building Com., School Bldg., 2 story, basement, brick, steel school. $150,000. **Maturity latter part June.** A. J. Rogers, 55 West 42nd St., New York, archt.

N. J., Moonachie—Bd. Educ. plans by J. L. T. Tillack, 173 Main St., Hackensack, Junior High School, 2 story, basement, brick, steel $150,000.

N. J., Morristown—Bd. Educ., O. M. Goble, dist. clk., 50 Early St., sketches by C. C. Voorhees, Schuyler Pl., 2 story, basement, brick, steel, Mills St. $150,000. Noted May 7.

N. J., North Plainfield (mail Plainfield)—Bd. Educ., 125 Sommerset St., will not build 2 story, basement, brick, steel, East End Sect. Project abandoned. Noted Nov. 27.

N. J., Oakhurst—Bd. Educ. Ocean Twp., bids in June, 2 story, basement, brick, steel school addition. $150,000. W. Pieper, 95 Summit Ave., Summit, archt. Noted Apr. 23.

N. J., Paterson—Bd. Educ., City Hall, School 18, 2 story, basement, brick, steel, rein.-con., plain found., Riverside Sect. $150,000 or more.

N. J., Pompton Lakes—Bd. Educ., T. J. Hutton, dist. clk., 96 Perrin Ave., will not build Senior High School, 2 story, basement, brick, steel $200,000. Project abandoned. J. Holt, 132 Market St., Paterson, archt. Noted Feb. 19.

N. J., Rahway—Bd. Educ., High School, sketches by Seymour Williams, 146 Irving St., Junior High School, 3 story, basement, brick, steel, rein.-con., St. George and Central Aves. $480,000.

N. J., Rutherford—T. J. Folks, archt., 488 East 33rd St., Paterson, bids in June, general contract 2 story, basement, brick, steel, rein.-con., school, Ames Ave. and Chestnut St., for St. Mary's Roman Catholic Church. $150,000. Noted May 7.

N. J., Union — Bd. Educ. bids probably in June, 2 story, basement, brick, steel addition to Connecticut Farms School, Stuyvesant and Morris Aves. $200,000. F. A. Elasser, 1000 Stuyvesant Ave., archt. Noted May 14.

N. J., Westwood—St. Andrews School, J. P. Lenihan, pastor, Washington Ave., 2 story, basement, 110 x 125 ft. school, Irvington St. and Washington Ave. $150,000. Project in abeyance. Fanning & Shaw, 49 Ward St., Paterson, archts. Noted Apr. 9.

N. Y., New York — Columbia University, Bway. and 116th St., sketches by J. G. Rogers, 154 East 46th St., 5 story, 170 x 260 ft. library. To exceed $1,000,000.

Constr. News page 224

Schools (Continued)

N. Y., Van Hornellsville—Town school addition. $200,000.

Tex., San Antonio—Bd. Educ., Lavaca and Water Sts., bids after May 31, altering 3 buildings, constructing 3 story, basement new building for vocational training school, plain found., incl. considerable new machinery for various vocational work. Main and Romana Sts. $150,000. P. H. Smith, Natl. Bank Commerce Bldg., archt. Phelps & DeWees, Gunter Bldg., School Bd., archts. Noted Apr. 2.

Tex., Wichita Falls—Bd. Educ., Junior College, incl. classrooms, auditorium, cafeteria, rein.-con., brick, plain found. $300,000 bond election postponed. **Maturity in 1932.** Noted Nov. 6.

BIDS ASKED

Ark., Little Rock—Philander Smith College, c/o G. C. Taylor, pres., 922 West 11th St., bids about July 3, rein.-con., brick, steel main college building, 2 concrete, brick dormitories, 20th and Washington Sts. $250,000. Thompson, Sanders & Ginocchio, Hall Bldg., archt.

Del., Marshallton—Delaware School Foundation, Du Pont Bldg., Wilmington, bids about June 1, Marshallton Consolidated School, 2 story, basement, brick, steel, rein.-con., plain found., Brandywine Hundred Dist. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts. Noted Apr. 30.

Ill., Maywood—Van Gunten & Van Gunten, assoc. archts., 26 East Huron St., Chicago, taking bids separate contracts Emerson School, 2 story, basement, brick, for Bd. Educ. $255,000. N. M. Dunning, 306 South Wabash Ave., archt. Noted April 2.

Ill., Peoria — Bd. School Inspectors, G. T. Mowart, secy., 300 North Monroe St., bids about July 1, Junior High School, 2 and 3 story, 250 x 450 ft., rein.-con., brick, plain found., incl. shops, science and music halls, art rooms, gymnasium, cafeteria. $800,000. Hewitt, Emerson & Gregg, Peoria Life Bldg., archts. and engrs. Noted Mar. 12.

Ind., Brookville—May 26, by School Comrs., rein.-con., brick school. $150,000. Henkel & Hanson, Connersville, archts.

Ind., Knightstown—June 2, by School Comrs., 2 story, basement, 75 x 100 ft., rein.-con., brick, stone high school. $150,000. McGuire & Shook, 941 North Meridian St., Indianapolis, archts.

Ind., Mackey—June 2, by Bd. Comrs. Gibson Co., 2 story, basement, rein.-con., brick, stone, grade and high school, incl. gymnasium, auditorium. $150,000. Sutton & Routt, Citizens Trust Bldg., Vincennes, archts.

Ind., Oakland City—June 8, by School Comrs., 2 story, basement, brick, steel high school, incl. gymnasium, auditorium, library. $150,000. H. E. Boyle Co., Furniture Bldg., Evansville, archt.

Ind., Seymour—May 26, by School Comrs., remodeling, rebuilding 2 brick, steel schools. $150,000. W. C. Findt, New Albany, archt.

Ind., Somerville—June 2, by School Comrs., brick, steel, stone, incl. private water supply, septic tank. $150,000. Sutton & Routt, Citizens Trust Bldg., Vincennes, archts.

La., Baton Rouge—June 16, by Gov. Long, Fine Arts Building, 3 story, brick, stucco, rein.-con., concrete found., for Louisiana State University. $150,000.

Me., Cape Elizabeth—Town, W. Leonard, chn. Com., taking bids altering and constructing Cottage Farm School, 2 story, basement, brick addition to Cottage Farm School, plain found. $150,000. Miller & Beal, Inc., 465 Congress St., Portland, archts.

Md., Baltimore — May 27, by Bd. Awards, altering and constructing 2 story, basement, 62 x 107 ft., brick, structural steel, rein.-con. addition to School 220, Washington Blvd. and Spence St. J. J. Zink, 2826 Overland Ave., archt. Kubitz & Koenig, Emerson Tower, engrs.

Mass., Everett—City School Building Com., bids about May 22, 2 story, basement, brick, stone, plain found., Locust St. $150,000. Desmond & Lord, 1 Beacon St., Boston, archts. Noted Mar. 19.

Mass., Hanover — School Building Comn. taking bids 2 story, basement, brick, stone school, plain found. $150,000. J. W. Beal Sons Co., 185 Devonshire St., Boston, archts. Noted Apr. 30.

Mass., Malden (br. Boston)—Immaculate Conception Roman Catholic Church, N. Neagle, pastor, taking bids 2 story, basement, brick, steel school, plain found., Highland Ave. $150,000. T. G. O'Connell, 134 Newbury St., Boston, archt.

N. J., Jersey City—F. J. Ricker, archt., 685 Hudson Ave., West New York, taking bids general contract 2 story, basement, 80 x 105 x irregular sized brick, steel school, rectory, Claremont Ave. and Clerk St. for Church of Our Lady of Sorrows, E. Monteleone, pastor, 75 Claremont Ave. $150,000. Noted May 14.

N. J., Newark—Bd. Educ., City Hall, bids about July 1, on revised sketches, Junior and Senior High School, 4 story, basement, brick, steel, incl. library, 2 gymnasiums, auditorum, stage, power plant, Chancellor Ave. $1,000,000. Guilbert & Betelle, 20 Branford Pl., archts. Noted Apr. 23.

N. J., Teaneck—Bd. Educ., High School, bids about July 1, 3 story, basement, brick, steel high school addition, Queen Anne Rd. $635,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Apr. 9.

N. J., Washington—May 25, by Bd. Educ., C. C. Bowers, dist. clk., 2 story, basement, brick, steel high school, North Carlton Ave. $150,000. C. G. Jones, 133 Academy St., Belleville, archt. Noted May 14.

N. Y., Alfred — June 9, by Commissioner Educ., Educ. Bldg., Albany, constructing School of Clayworking and Ceramics, also service connections (tunnels). Alfred University; adv. E. N.-R. May 21.

Pa., Greentree—St. Margarets Roman Catholic Congregation, J. Angel, pastor, Steuben St., taking bids on revised plans 3 story, basement, 58 x 98 ft., brick, limestone school, church, Mansfield St. and Greenfield Rd. $150,000. R. Marlier, Empire Bldg., Pittsburgh, archt. Noted Mar. 12.

Vt., Northfield—Sigma Phi Epsilon Fraternity, Norwich University, taking bids 3 story, basement, brick fraternity house, plain found. $150,000; heating, plumbing and electrical work, est. $25,000. H. Goodspeed, 148 State St., Boston, Mass., archt. Noted Mar. 26.

Wis., Madison—May 25, by Bd. Educ., F. W. Erickson, secy., 4 story, 70 x 400 ft., brick, rein.-con., steel addition to East High School. E. Riley, Madison, archt.

CONTRACTS AWARDED

Conn., Meriden—E. King, pres. Bd. Trustees Industrial School for Boys, brick, steel, concrete school, staff house, cottages, administration building, hospital and vocational school, to Merritt, Chapman & Scott, 292 Pequot Ave., New London, $538,000. Noted Feb. 5.

Conn., New Britain — St. Joseph's Roman Catholic Church, J. Donohue, pastor, 195 South Main St., 1 story, basement, 100 x 170 ft., brick, limestone school, parish hall, Edson St., to T. J. Bogan, 50 Riggs Ave., West Hartford, $112,000. Noted Feb. 5.

D. C., Wash.—District Comrs., District Bldg., general contract Alex. Shepherd School, to Loundon-Rust Co., 1406 G St. N. W., $95,665; B. W. Murch School, to T. T. Taylor Co., Dist. Natl. Bank Bldg., $86,520. Noted Apr. 30.

Ind., Plainfield—Bd. School Comrs., general contract 2 story, basement, brick, steel, stone high school, incl. gymnasium, auditorium, to C. E. Cooper, Odon. Est. $150,000. Noted Apr. 9.

Me., Charleston—Higgins Classical Institute, E. E. Herrick, pres. Bd. Trustees, and Crowell & Lancaster, archts., 6 State St., Bangor, 3 story, basement, 60 x 110 ft., brick school, plain found., to W. H. McPherson, 59 Park St., Bangor, est. $150,000; heating and plumbing, to J. H. Stetson Co., 65 Lisbon St., Lewiston, electrical work, to Dole Co., 25 Franklin St., Bangor, est. $25,000. Noted May 7.

Md., Baltimore — Bd. Awards, Forest Park Junior High School, 3 story, basement, brick, structural steel, concrete, to Henry L. Maas & Son, 1119 Ensor St., $662,969. Noted Apr. 16.

Mass., Cambridge—Parish of Our Lady of Pity (Roman Catholic), A. Millet, pastor, 35 Middlesex St., and J. G. Morissette, archt., 575 Essex St., Lawrence, 3 story, basement, irregular sized, brick, stone, steel convent, plain found., Notre Dame St., and 2 story, basement, 85 x 145 ft., brick, stone, steel school, incl. assembly hall and coal pocket, plain found., Sargent and Notre Dame Sts., to Landry & Marsolais, 2322 Mass. Ave. Est. $150,000 and $200,000 respectively. Noted Apr. 23.

Mass., Charlestown (sta. Boston)—City of Boston, Dpt. School Buildings, 3 story, basement intermediate school, brick, limestone, plain found., to Matthew Cummings Co., 43 Tremont St., Boston, $537,000. Noted May 15 Daily.

Mass., Medford (br. Boston)—Tufts College, J. A. Cousens, pres., and Andrews, Jones, Biscoe & Whittemore, archts., 50 Congress St., Boston, 2 and 3 story, basement, irregular sized, brick, steel physical education building, plain found., College Grounds, to L. P. Soule & Son, 80 Boylston St., Boston. Est. $750,000. Noted Apr. 16.

Mich., Muskegon—H. H. Linn, bus. mgr. Bd. Educ., 2 story basement, brick, steel, rein.-con., plain found., to Spence Bros. Constr. Co., Saginaw, $222,294; heating, to Reid & Graff, Muskegon Heights, $67,662. Noted Apr. 16.

Minn., St. Paul—College of St. Catherine, Randolph St. and Cleveland Ave., general contract 3 story, basement, 92 x 172 ft., brick, steel health center-physical education building, to W. Butler Co., 630 Hamm Bldg., St. Paul, $165,000. Noted Dec. 11.

Minn., St. Paul—College of St. Thomas, M. A. Schumacher, pres., Cleveland and Summit Aves., general contract 2 story, basement, brick, stone administration building, Summit Ave., between Cleveland and Cretin Aves., to Foley Bros., 209 Gilfillan Blk. Est. $250,000. Noted Jan. 8.

N. H., Rochester—City, L. M. Duffee, mayor, City Hall, and W. S. Holmes Co., archts., 18 Newburry St., Boston, Mass., 2 story, basement, brick, stone school, plain found., to A. F. Smiley Constr. Co., Oak Hill Bldg., Pawtucket, R. I. Est. $150,000. Noted Apr. 23.

N. Y., Albany—St. Agnes School, Loudonville Heights, 2 story granite, stone school unit, to Thomas Stephens & Sons, 275 Lark St. Est. $200,000. Noted Oct. 30.

Pa., Erie—Bd. Educ., R. S. Scobell, secy., Library Bldg, general contract, 1 story, 40 x 270 ft., brick, steel addition to Technical High School, to Kirschner Bros., 423 East 9th St., $34,875, plumbing and sewering, to Clougherty & Hilbert, 7 West 29th St., $2,284; heating and ventilating, to A. S. Garvey, 110 West 12th St., $7,962; electric wiring, to Hills Electric Co., 2319 Chestnut St., $9,923. Grand total $55,044. Noted Apr. 2.

Tenn., Memphis—Bd. Educ., general contract Bethel Grove School, brick, concrete, to H. A. McGuire, Dermon Bldg., $89,213; plumbing, to Fisher Plumbing & Heating Co., 625 Greenlawn St., $5,895; elevators, to Dawkins Electric Co. 26 North 2nd St., $3,085. Grand total $98,193.

Vt., Burlington—Mount St. Mary Academy, M. Alphonsus, 2 story, basement, brick, steel school, to J. E. Cashman, 77 College St. $200,000. Noted May 7.

Vt., Burlington—St. Anthony Roman Catholic Church, W. A. Piamondon, pastor, 2 and 3 story, basement, brick, stone school, convent, plain founds., Pine and Ferguson Sts., to James E. Cashman, Inc., 77 College St. Est. exceeds $150,000.

Vt., Montpelier—St. Augustin Roman Catholic Parish, W. P. Crosby, 52 Barre St., 2 story, basement, brick, stone high school, gymnasium, plain found., Barre St. and Fullerton Ave., to C. D. Marsh Constr. Co., Woodsville, N. H. $150,000 or more.

Wis., Milwaukee—Bd. Educ., excavating for 16th St. School, to Reisen Building Corp., 2219 North 3rd St., $43,439; masonry work, to R. L. Reisinger Co., 1959 Richards St., $45,800; cut stone, to P. Schmidt & Co., 3220 Lancaster Ave., $7,189; structural steel, to C. Hennecke Co., 1352 North Pierce St., $3,325; ornamental iron, to Badger Iron & Wire Wks., 928 Winnebago Ave., $1,330; carpentry work, to F. Kiskelson, 439 18th Ave., $18,700; roofing, to F. J. A. Christianson, 68 East Wisconsin Ave., $1,980. Grand total $121,763. Noted Apr. 26 Daily.

Wis., Milwaukee—Bd. Educ., excavating for Bartlett School, to Klupp Bros., 860 44th Ave., $6,600; carpentry work, to F. Mikkelson, 439 18th Ave., $8,585; plastering, to E. Otya, 4421 North Frederick Ave., $3,500; tile, to Cafmeyer Bros., 318 Juneau Ave., $956; marble, to Andres Stone & Marble Co., 110 Keefe Ave., $3,164; painting and glazing, to P. B. Woboril, 524 Jackson St., $4,232; plumbing, to Dahl Plumbing Co., 1613 State St., $6,685; heating, to S. V. Hanley, 209 Farwell Ave., $9,393; heat regulator, to Johnson Serv. Co., 149 East Michigan Ave., $1,920. Grand total $45,035.

Ont., Ottawa—Ottawa University, Wilbred St., 3 story, basement, concrete, steel, brick college addition, to H. Dagenais, 225 St. Patrick St. Est. $150,000.

Ont., Ottawa—Public School Bd., 330 Gilmore St., 3 story, 101 x 176 ft. addition to Hopewell Ave. School, to A. I. Garvock, Regent Theatre Bldg.; 1 story, basement, 67 x 133 ft. addition to Glashan School, and 2 story, basement, 40 x 70 ft. addition to Connaught School, to Taylor & Lackel, 53 Queen St., all foregoing concrete, brick, stone, steel. Est. $150,000.

Ont., Sudbury—J. R. Hurtubise, secy., Separate School Bd., 19 Durham St. N., general contract three 2 story, basement, brick, steel, stone, concrete school additions, to Cox Constr. Co. Ltd., 200 Bay St., Toronto. Est. $175,000. Noted Apr. 16.

THEATRES

PROPOSED WORK

Calif., Los Angeles—W. H. Leimert Co., 8107 Vermont Ave., plans by Morgan, Walls & Clements, 1135 Van Nuys Bldg., rein.-con., tile, steel theatre, store, Crenshaw Blvd. and Vernon Ave., Leimert Park. $150,000.

N. J., Trenton—F. V. Storrs, 33 West 42nd St., New York, soon lets contract rebuilding theatre, recently destroyed by fire. $400,000.

N. Y., New York—F. H. T. Holding Corp., 309 West 23rd St., altering theater, store, 302 West 24th St. $350,000. No Project in abeyance. T. W. Lamb, 701 7th Ave., archt. Noted Apr. 16.

Pa., Bradford—Imperial Chain Theatres, Inc., Clark Bldg., Pittsburgh, plans by Marks & Kann, Home Trust Bldg., Pittsburgh, theatre 1,500 seating capacity. $150,000.

Tex., Amarillo—Amarillo Theatre Co., plans by W. S. Dunne, Melba Bldg., Dallas, and Rittenberry & Carder, assoc. archts., 2 story, basement, 140 x 180 ft. theatre, 9th and Polk Sts. $400,000.

BIDS ASKED

Ont., St. Thomas—May 26, by H. G. Duerr, archt., Lumsden Bldg., Toronto, 2 story, basement, 58 to 86 ft. wide, 168 ft. long brick, concrete, steel, stone theatre, for Famous Players Canadian Corp., Royal Bank Bldg., Toronto. $150,000. Noted May 14.

CONTRACTS AWARDED

Colo., Denver—H. Brown, pres. Radio-Keith-Orpheum Theatres, Inc., 190 North State St., St., Chicago, Ill, superstructure, brick steel theatre, 2,000 seating capacity, to F. J. Kirchof Constr. Co., 700 Lawrence St. Est. $1,000,000. Noted Apr. 22.

Mass., Boston — Terminal Theatre Co., N. Thompson, 312 Congress St., 1 story, basement, brick, granite, steel, plain found., South Station Sect., to J. M. and C. J. Buckley Co., 183 Essex St. Est. $150,000. Noted Apr. 9.

BANKS

CONTRACTS AWARDED

Conn., Middletown — Mechanics & Farmers Savings Bank, 189 Main St., steel, brick addition, to Hoggson Bros., 485 5th Ave., New York. $150,000 or more. Contractor taking separate contract bids. Noted May 7.

Mass., Roxbury (sta. Boston)—Grove Hall Savings Bank, 648 Warren St., 1 story, basement, brick, stone, concrete, steel, plain found., to W. and L. Eng. Co., 694 Washington St., Boston. Est. $150,000. Noted May 7.

Mich., Lansing—L. and K. C. Black, archts., Capital Savings & Loan Bldg., 15 story, basement, brick, steel, stone, rein.-con., plain found., to Reniger Constr. Co., Lansing, for City Natl. Bank, Washington Ave. Noted Apr. 2.

Constr. News page 225

OFFICES

PROPOSED WORK

Ind., Hammond—J. R. Gordon, plans by Lowenberg & Lowenberg, 11 West Monroe St., Chicago, Ill., 2 story, 60 x 140 ft. office, store building, State and Hohman Sts. $150,000.

Mo., St. Louis—Syndicate of New York and Pittsburgh Interests c/o Boyer & Armstrong, archts., Arcade Bldg., sketches 40 story, basement, 53 x 127 ft., rein.-con., steel, stone, brick, Bway., Olive and Pine Sts.; remodeling, constructing 1 story addition to 11 story Bank of Commerce Building, Bway. and Olive St.; remodeling 16 story Federal Commerce Trust Bldg., Bway. and Pine Sts. and connecting both buildings with control tower building. $2,500,000.

Ont., Toronto—North American Life Insurance Co., 112 King St. W., sketches by Marani, Lawson & Morris, 38 Bloor St. W., 16-18 story, rein.-con. or structural steel, and stone, brick, marble, tile office building, King St. W., $1,500,000.

CONTRACTS AWARDED

N. J., Westfield—Elizabethtown Consolidated Gas Co., 16 West Jersey St., general contract 3 story, basement office, and 1 story, basement, garage buildings, to G. Neumann & Sons, 814 Embree Crescent. Est. $150,000. Noted Apr. 16.

STORES

PROPOSED WORK

N. J., Asbury Park—Bd. City Comrs., A. G. King, clk., City Hall, bids probably in June, general contract 2 story, basement, brick, steel stores, bath houses, 4th and 5th Sts. $250,000. Warren & Wetmore, 16 East 47th St., New York, archts.

N. J., Paterson—Owner, c/o J. Bellomo, archt., 6 Park Ave., sketches 2 story, basement, brick, steel store, apartment, Mill and Grand Sts. $150,000.

BIDS ASKED

Ark., Little Rock—Pfeifer Bros., P. Pfeifer, pres., 514-24 Main St., bids about July 1 or Aug. 1, 4 story (ultimately 8 story), basement, 140 x 154 ft., concrete, brick, steel store, Main and 7th Sts. $500,000. Thompson, Sanders & Ginocchio, Hall Bldg., archts. C. E. Swanson, 225 North Michigan Ave., Chicago, Ill., interior archt. Noted May 14.

Mass., Pittsfield—May 25, by England Bros., North St., and G. E. Haynes, archt., 29 George St., altering and constructing 3 story, basement, brick department store addition, plain found. $150,000.

PUBLIC

PROPOSED WORK

Calif., San Diego—MUSEUM—City Council plans by W. T. Johnson, Trust & Savings Bank Bldg., Class A museum, at Balboa Park. $200,000.

Idaho, Blackfoot — ASYLUM — State, Boise, plans by C. Richardson, Lewiston, and W. L. Skidmore, Pocatello, assoc. archts., concrete asylum. $250,000. Noted Apr. 2.

Ia., Council Bluffs—CITY HALL and WATERWORKS—City, c/o J. C. Jensen, chn. Water Bd., sketches concrete, brick, stone city hall waterworks and building. $200,000.

Mass., Jamaica Plain (sta. Boston)—LIBRARY—City of Boston, Trustees Public Library, Copley Sq., plans by Maginnis & Walsh, Statler Bldg., Boston, and soon takes bids 1 story, basement, brick, stone branch library, plain found., Boylston Sect. $150,000. Noted Apr. 9.

N. J., Bridgton—MUNICIPAL—Bd. City Council, City Hall, 2 story, basement, brick, steel, Memorial Field. $150,000. **Maturity probably soon.**

N. J., Jersey City—ARMORY—State Military Bd., C. Hill, in charge, Trenton, revised plans by J. O. Hunt & H. A. Kelly, 921 Bergen Ave., 3 story, basement, brick, steel, Montgomery St., Summit, Jordon and Tuers Aves. $800,000. Noted Oct. 6 Daily.

N. J., Paterson—OFFICE—Bd. City Comrs., City Hall, altering Y.M.C.A. building into city office building, 141 Ellison St. $150,000. **Maturity probably soon.** Architect not selected.

N. J., Westwood—LIBRARY—Bd. Trustees Free Pub. Library, 2 story, brick, steel. $150,000. Architect not selected. **Maturity indefinite.** Noted Apr. 9.

Okla., Waurika—COURT HOUSE—Jefferson Co. sketches court house, Main St. $150,000. E. J. Beau, co. comr. Architect not selected.

Ontario—FEDERAL—Dpt. P. Wks., Parliament Bldgs., Ottawa, expending $21,100 for federal public buildings in Belleville: $12,000 in Brockville; $26,000 in Copper Cliff; $1,500 in Fort Frances; $50,000 in Fort William; $4,000 in Gore Bay; $50,000 in Guelph; $1,500 in Hawkesbury; $8,000 in Keewatin; $1,200 in Leamington; $61,000 in New Iiskeard; $1,100 in North Bay; $5,000 in Orillia; $25,000 in Parry Sound; $57,000 in Penetanguishene; $25,000 in Perth; $5,000 in Port Arthur; $40,000 in Port Credit; $41,000 in Stratford; $5,500 in Sturgeon Falls; $4,000 in Sydenham; $4,000 in Thorold; $2,000 in Welland; $100,000 in Windsor; $125,000 for miscellaneous; $670,000 for customs house in Toronto; $33,500 for postal station, mechanical equipment, Toronto; all foregoing concrete, brick, stone, steel construction. K. M. Cameron, Dpt. P. Wks., Parliament Bldgs., Ottawa, ch. engr.

Constr. News page 226

BIDS ASKED

Conn., Newtown—LIBRARY—Town, T. F. Brew, chn., taking bids Cyrenius H. Booth Memorial Library, 2 story, basement, 35 x 70 ft., and 32 x 65 ft., brick, stone, Main St. $200,000. P. N. Sunderland, 248 Main St., Danbury, archt. Noted Jan. 15.

Mass., Cambridge—COURT HOUSE—Middlesex Co., W. C. Wardwell, Court House, bids about June 1, 3 and 4 story, basement, brick, stone, steel, plain found., East Cambridge. $200,000. C. R. Greco, 11 Beacon St., Boston, archts. Noted Aug. 7.

Mass., Framingham—REFORMATORY—May 26, by Mrs. J. D. Hodder, supt. Reformatory for Women, Framingham, altering and constructing 3 story, basement, brick, steel additions, plain found., for Commonwealth of Massachusetts, Dpt. Correction, State House Boston, $150,000; heating, plumbing, electrical and sprinkler work, $25,000 or more.

N. Y., Syracuse—ARMORY—June 5, by Adjutant General, Div. Military & Naval Affairs, Albany, state armory addition; adv. E. N.-R. May 21. Noted May 7.

Tenn., Huntington—COURT HOUSE—Bd. Comrs. Carroll Co. bids about June 10, 2 story, basement, rein.-con., limestone, brick, incl. auditorium, kitchen, Public Square. $150,000. Hart, Freeland & Roberts, Independent Life Bldg., Nashville, archts. Noted May 7.

CONTRACTS AWARDED

Ala., Wetumpka — COURT HOUSE — Elmore Co., court house, to A. Blair, 1st Nat'l Bank Bldg., Montgomery, $216,000.

Mass., Marblehead—AMERICAN LEGION—Town, R. Tutt, clk. Bd., altering and reconstructing 3 story, basement, brick, steel, plain found., to Parker & Walsh, 119 Webb St., Salem. Est. $150,000.

Minn., St. Paul—AUDITORIUM—City, general contract rein.-con., brick addition, to W. M. Murphy & Son, 1610 Pioneer Bldg., $643,880. Noted Apr. 23.

N. Y., Attica—PRISON—Dpt. Correction, Albany, general contract administration building, hospital, laundry, bath building, state shop, shop building, textile shop, maintenance storehouse, prison wall, addition and service connections at Attica State Prison, to J. Weinstein, 66 Court St., Brooklyn, $1,277,338; heating, to Chippewa Plumbing Co., 279 Chicago St., Buffalo, $185,320; sanitary work, to C. C. Grimm, 259 Delaware Ave., Buffalo, $85,107; electrical work, to T. H. Green, 31 North Water St., Rochester, $93,499. Grand total $1,641,264. Noted Mar. 19.

Pa., Wilkes-Barre—SERVICE—Central Poor Dist. of Lucerne Co., G. K. Brown, secy., general contract 3 story, basement, rein.-con., brick service building and kitchen, plain found., to E. J. Couples, Market St., Kingston, $195,900; heating, plumbing, ventilating, to J. L. Turner & Co., Nanticoke, $26,826. Noted Apr. 2.

UNCLASSIFIED

PROPOSED WORK

Calif., Los Angeles—SALES and SERVICE—Auburn-Fuller Co., c/o A. C. Martin, archt., Higgins Bldg., part 1, 4 and 5 story, 140 x 195 ft. Class A auto sales and service building, Wilshire Blvd. and Mariposa Ave. $200,000.

N. J., Atlantic City—CASINO, etc.—Park View Beachfront Co., H. Cassman, pres., Boardwalk, rebuilding 2 story, basement, brick, steel casino, stores, 1723-31 Boardwalk. $150,000. **Maturity probably soon.**

N. J., Lawrenceville—HOME—E. G. Perrot, archt., 1211 Arch St., Phila., Pa., soon lets general contract 3 story, basement, brick, steel addition to Morris Hall, for Morris Home for Aged. $150,000.

Pa., Erie—ART MUSEUM—Erie Art Club, W. B. Walling, pres., sketches art museum, probably stone, on 286 x 450 ft. site, West 6th St. $500,000. Architect not selected.

CONTRACTS AWARDED

Conn., Wethersfield—HOME—Church Home of Hartford, Inc., 123 Retreat Ave., Hartford, 3 story, basement, 45 x 175 ft., brick, granite, limestone church home, Ridge Rd., to Tychsen Bros., 1093 Farmington Ave., West Hartford. Est. $150,000.

N. J., Hopewell—ORPHANAGE—E. G. Perrot, archt., 1211 Arch St., Phila., general contract 3 story, basement, 50 x 100 ft., brick, steel, to Conneen Constr. Co., 770 South Schuylkill Ave., Phila., Pa., for St. Michaels Orphan Asylum, plumbing and heating, to P. S. Slack, 211 Perry St., Trenton. Est. $150,000. Noted Apr. 23.

R. I., Providence—EXCHANGE—New England Telephone & Telegraph Co., 245 State St., Boston, Mass., 2 story, basement, 60 x 120 ft., brick, stone, steel, to Chas. B. Maguire Co., 507 Grosvenor Bldg. Est. $150,000. Noted Apr. 16.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Arbuckle—PRE-COOLING PLANT—Union Ice Cooling Co., 354 Pine St., San Francisco, sketches pre-cooling plant. $40,000. Private plans.

Calif., Los Angeles—PLANT—Pacific Coast Steel Corp., 215 Market St., San Francisco, plant expansions, incl. open hearth, angle mill, enlarging forge pressing facilities, on 17 acre site, Slauson Ave. and Atlantic Blvd.

Conn., Bridgeport—PLANT—Jenkins Valve Co., 510 Main St., plans by Lockwood Greene Engineers, Inc., 100 East 42nd St., New York, 1 story, 65 x 65 ft., brick, steel addition, also installing 10 ton crane, Railroad Ave. To exceed $40,000 incl. equipment.

Fla., Largo — PACKING PLANT — Citrus Growers Assn., J. S. Taylor, Jr., mgr., rebuilding packing plant, reecntly destroyed by fire. $75,000. Architect not selected.

Ga., Atlanta—BAKING PLANT—National Biscuit Co., 449 West 14th St., New York, 3 story, 80 x 250 ft. addition, Magnum and Elliott Sts. $500,000. Project in abeyance until fall or later. Private plans. Noted Apr. 2.

Ill., Joliet—MILK PLANT—Beatrice Creamery Co., 1526 South State St., Chicago, will not build plant. $200,000. Project abandoned. Noted May 14.

N. J., Hoboken—FACTORY—Garsten Realties Co., J. Romanno, pres., 1827 Bergen Turnpike, 1 story, basement, brick, steel, Madison and Jefferson Sts. between 14th and 15th Sts. $40,000. Project in abeyance. Noted Apr. 30.

N. J., Plainfield—BAKERY—Puritan Baking Co., E. Brancati, prop., 286 Tewill Rd., plans by C. C. Bell, 17 North Ave. E. Cranford, 1 story, basement, brick, steel, cement block. $40,000. **Maturity probably soon.**

N. J., Roselle—DRESS FACTORY—Roselle Frocks, Inc., 1107 Chandler Ave., sketches 2 story, basement, 80 x 100 ft., brick, steel, Chandler Ave. $40,000.

N. J., Rutherford—FACTORY—S. Cordo, 23 West Erie Ave., plans by F. Perrone, 104 Midland Ave., Garfield, 2 story, basement, brick, steel addition. $40,000. Noted May 7.

N. Y., New York — BAKING PLANT — National Biscuit Co., 449 West 14th St., baking plant. To exceed $1,000,000. **Maturity soon.** Private plans. Noted Mar. 6, 1930.

O., Newton Falls—ROLLING MILL—Newton Steel Co., E. F. Clark, pres., 1st Natl. Bank Bldg., Youngstown, altering and re-equipping rolling mill. $1,000,000. **Maturity indefinite.**

Pa., Erie — RADIO MANUFACTURING PLANT—Erie Resistor Corp. addition, West 12th St. $40,000 incl. equipment.

Pa., Mt. Oliver—LAUNDRY—Lincoln Laundry Co., Pennsylvania Ave. and School Way, Pittsburgh, plans by C. Wenzel, 320 Mountain St., Pittsburgh, 1 story, brick, steel, Pennsylvania Ave. and School Way. $50,000.

O., Euclid (br. Cleveland)—MANUFACTURING PLANT—Addressograph-Multigraph Corp., 1814 East 40th St., Cleveland, sketches new plant. $1,000,000.

Tex., Corpus Christi—CHEMICAL PLANT—Southern Alkali Corp., A. Wells, in charge, c/o American Cyanamid Co., 535 5th Ave., New York, plans chemical plant, to incl. several large manufacturing units, accessories, loading docks, warehouses, electric lighting unit utilities, etc., on 350 acre site, also 2 mi. ship canal, large turning basin. $10,000,000-$15,000,000. Private plans.

Tex., Dallas—PACKING PLANT—Armstrong Packing Co., 2300 Cockrell Ave., soon lets contract 4 or 7 story, 90 x 90 ft., brick, steel, concrete addition. $250,000.

Tex., Hillsboro—ICE PLANT—W. S. Grimes and W. D. Little, Hillsboro and Fort Worth, 1 story, brick, steel, rein.-con., 60 ton capacity, plain found., Elm St. $50,000. Private plans.

BIDS ASKED

Ark., Everton — PLANT — See "Contracts Awarded."

Mass., Greenfield—ARTIFICIAL ICE PLANT—Greenfield Ice & Trucking Co., R. C. Phelps, 50 Union St., taking bids 1 story, brick, steel, Bernardston Rd. $40,000. R. E. Palmer, 58 Suffolk St., Holyoke, engr. Noted May 14.

N. J., East Rutherford—FACTORY—J. T. Camlet, archt., 26 Piaget Ave., Clifton, bids about June 1, general contract 2 story, basement, 30 x 70 ft., brick, steel, Mozart St., for East Rutherford Syringe Co., 75 Mozart St. $40,000. Noted Mar. 12.

N. J., Hoboken—BAKING PLANT—Continental Baking Co., Inc., 14th St., taking bids general contract altering 4 story, basement, brick, steel, Park Ave. and 14th St. $40,000. Private plans.

N. J., Jersey City—BAKERY and STORE—G. W. Backoff, archt., 623 Broad St., Newark, taking bids altering and constructing 1 story, basement, brick, steel addition, 872 Newark Ave., for F. Schreiber, c/o owner. $40,000.

N. J., Millburn — DRESS FACTORY — E. P. Bonnett, archt., 363 Bloomfield Ave., Montclair, taking bids general contract 2 story, basement, 45 x 70 ft., brick, steel, for P. Masella, 40 Main St. $40,000. Noted May 7.

N. Y., Mariners Harbor—DAIRY PLANT—Weissglass Dairies Co., 2014 Forest Ave., taking bids 1 story, basement, brick, steel, plain found. $40,000. H. W. Pelcher, 286 Richmond Ave., Port Richmond, archts.

N. Y., New York—MANUFACTURING—See "Contracts Awarded."

R. I., Woonsocket—PLANT—Falk Bros., 35 Main St., taking bids 2 story, brick dyeing and cleansing plant, plain found., Social St. $40,000. O. H. Drouin, Mounment Sq., archt.

Tex., Corpus Christi — OIL REFINERY PLANT — Houston Oil Co., Petroleum Bldg., Houston, and Corpus Christi, taking bids enlarging present refinery plant, incl. several large steel storage tanks, additional equipment for refining. $1,000,000. Private plans.

Factories and Mills (Continued)

Tex., Crystal City—ICE PLANT—Shippers Co-operative Ice Co. taking bids 1 story, brick, reinforced steel. $150,000. Private plans. Noted Apr. 23.

CONTRACTS AWARDED

Ark., Everton—PLANT—Silica Products Co., Inc., c/o D. D. Dunkin, Harrison, designing, constructing plant, own forces. $75,000. Private plans.

Calif., Emeryville—LINOLEUM FACTORY—Paraffine Cos., Inc., 475 Brannan St., San Francisco, 1 story, brick, steel, caisson found., to MacDonald & Kahn, Financial Center Bldg., San Francisco, $50,000.

Calif., Orange—PRE-COOLING PLANT—Orange Mutual Citrus Assn., 2 story, basement, 85 x 135 ft., brick, steel, to A. G. Schmidt, 200 Builders Exch. Bldg., Santa Ana, $80,000. Noted May 7.

Ind., Indianapolis — PLANT — Blue Valley Creamery Co., West and Market Sts., general contract 2 story, basement, 60 x 90 ft., brick, steel, to W. Van Landingham, 309 Lemcke Bldg. Est. $40,000.

Miss., Natchez—PLANT—Mississippi Match Co., subsidiary International Match Corp., 25 West 43d St., New York, general contract, 1 story, concrete, steel, brick plant, incl. 2 warehouses, garage, chlorate building, oil house, gate house, trucking tracks, to W. G. Wetmore Constr. Co., Jackson, $120,523. This corrects report in Mar. 26 issue.

N. H., Manchester—BAKERY—Genest Bros., 640 Harvard St., altering and constructing 2 story, brick addition, to J. Pomerleau, 122 Laval St. Est. $40,000.

N. J., Paterson—DYE PLANT—Expert Dyeing Co., 17 East 24th St., general contract 1 story, basement, 90 x 125 ft. brick, steel, to Gaetano Roberto, 229 East 16th St. Est. $40,000.

N. Y., Hampton Bays — DISTRIBUTING PLANT—Sheffield Farms Co., 524 West 57th St., New York, milk distribution plant addition, to Duryea-Baird, Windmill Lane, Southampton Est. $40,000. Noted Apr. 30.

N. Y., New York—MANUFACTURING—E Alpern, 527 Tiffany St., 1 story, 100 x 100 ft light manufacturing, Northern St. and Randall Ave., separate contracts. $40,000. N. Rotholtz, 155 East 42nd St., archt.

N. Y., Sonyea — BAKERY — Dpt. Mental Hygiene, State Office Bldg., Albany, general contract bakery at Craig Colony, to D. Elander, Inc., 341 East 3rd St., Jamestown, $29,794; heating, to J. E. Reid, 504 Capen Blvd., Buffalo, $2,627; sanitary work, to Bareham & MacFarland, 136 North St., Rochester, $2,645; electrical work, to W. Kallack, 926 Bay St., Rochester, $2,379. Grand total $37,445. Noted Apr. 2.

O., Warren—MILL—United States Gypsum Co., c/o J. H. Nold, ch. engr., 300 West Adams St., Chicago, Ill., 1 story, 500 ft. long, brick, concrete, to H. K. Ferguson Co., Hanna Bldg., Cleveland. Est. $200,000.

Pa., Bradford—REFINERY—Kendall Refining Co., c/o J. B. Fisher, in charge, Kendall Ave., steel re-run still unit, to Alco Products Co., Inc., c/o American Locomotive Co., 30 Church St., New York; refrigerating system, to York Ice Mchy. Co., York; chilling tower, carpenter type, to M. B. Miller, 501 5th Ave., New York. Est. $154,000. Noted May 14.

Pa., Pittsburgh—FACTORY—R. M. Reutti, archt., Whitfield Bldg., 1 story, basement, 55 x 100 ft., brick, steel, to D. Gittings, 7732 Hamilton Ave. Est. $50,000. Noted May 7.

R. I., Harrisville—DYE PLANT—Stillwater Worsted Co., Harrisville, 3 story, brick, steel addition, plain found., to O. D. Purington & Co., 49 Westminster St., Providence, Est. $40,000.

Tenn., Nashville—FACTORY—Jarman Shoe Co., Gallatin Ave., factory addition, to Foster & Creighton, 4th and 1st Natl. Bank Bldg. Est. $40,000.

Ont., Hamilton — PACKING PLANT — John Duff & Sons Ltd., Hillyard St., general contract 2 story, 75 x 150 ft., rein.-con., incl. steam heating, refrigeration, Frid Constr. Co., Terminal Bldg.; excavation, to A. Cope & Sons, 19 Albert St. Est. $125,000. Noted Apr. 23.

GARAGES

PROPOSED WORK

Conn., West Hartford (br. Hartford) Smith & Jessen, Park Rd., plans by W. P. Crabtree, Jr., 252 Asylum St., Hartford, 1 story, basement, 35 x 108 ft. and 35 x 55 ft., brick, rein.-con., garage, shop, store, plain found., Park Rd. $40,000.

N. Y., New York—C. Ciampi Realty & Building Corp., 2095 Ryer Ave., sketches by M. Siegel, 1775 Bway., 2 story, 100 x 125 ft. service garage, Morris Park Ave. and Wyatt St. $60,000.

N. Y., New York—S. Cincelli, 2392 Arthur Ave., bids late in August, 1 story, 90 x 119 ft. service garage, Hoffman and 184th Sts. $40,000. M. W. Del Gaudio, 545 5th Ave., archt. Noted Apr. 23.

N. Y., New York—Enavon Realty Co., 17 Leroy St., plans by M. W. Del Gaudio, 545 5th Ave., garage, office, 18 Morton St. $150,000. **Maturity indefinite.**

R. I., Richmond—State, Dpt. State Police, New Industrial Trust Bldg., Providence, sketches by Jackson, Robertson & Adams, 1216 Turks Head Bldg., Providence, 1 and 2 story, brick garage and police barracks. $50,000 or more.

BIDS ASKED

Mass., Salem—Estate of M. M. Creedon, P. Creedon, in charge, 428 Essex St., taking bids altering and constructing 1 story, brick, concrete, steel, service garage, plain found., 430 Essex St. $40,000. Andrews, Jones, Biscoe & Whitemore, 50 Congress St., Buston, archts.

Mass., Springfield—See "Contracts Awarded."

N. J., East Orange—W. F. Bower, archt., 437 Main St., taking bids general contract 1 story, basement, 100 x 100 ft., brick, steel auto repair shops, laundry, South Arlington and Central Aves., for P. K. Bowers & Co., 189 Market St., Newark. $40,000.

N. Y., Edgemere—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Leominster—City, 1 story, brick, concrete police garage, city electrician's room and repair shop, rear West St., to F. Nye, 68 Cottage St. Est. $40,000.

Mass., Melrose — Eastern Massachusetts Street Ry. Co., 38 Chauncy St., Boston, 1 story, brick, steel, rein.-con. garage, office, Green St. $50,000. Owner builds. Private plans. Noted Apr. 23.

Mass., Springfield — R. Bennet, c/o Amer. Wrecking Co., 23 Hannon St., 1 story, brick, concrete, steel garage, plain found., 208 Sharon St., day labor. $50,000. Private plans.

Mass., Watertown — D. A. Papalia, 129 Waverly Ave., 1 story, brick, concrete, steel garage, repair shop, plain found., to Taverna Bros., 26 Cushing St., Cambridge. Est. $40,000. Noted May 7.

N. H., Nashua—Texas Co., Park Sq. Bldg., Boston, Mass., 1 story, concrete service station, Main and Tyler Sts., to P. J. Cornelissen, 105 Brayton Rd., Brighton, Mass. Est. $40,000.

N. Y., Edgemere — A. Mayes, Reed Lane, Flushing, service garage, Amstel Blvd. and Beach 42nd St., day labor and separate contracts. $40,000. **Maturity late in July.** J. Unger, 93 Main St., Flushing, archt.

N. Y., New York—Webster Auto Wrecking Co., Carter Ave. and 174th St., 40 x 180 ft. garage, shop, to Reger Contg. Co., c/o owner Est. exceeds $40,000. Noted Apr. 23.

R. I., Providence—Tramonti Auto Supply, J Tramonti, 361 Bway., 1 story, brick, concrete steel, plain found., Bway., to A. C. Constr Co., 250 Jastram St., $45,000.

SHOPS AND FOUNDRIES

PROPOSED WORK

N. Y., Flushing—REPAIR SHOP—A. Beaude, 140-34 Brookville Blvd., 2 story, Brookville and Conduit Blvds. $40,000. **Maturity indefinite.** Noted Apr. 23.

Pa., Springdale — FOUNDRY — Springdale Fdry. Co., G. Chismark, secy., 7th and Mill Sts., Tarentum, sketches 1 story, cupola, 50 x 130 ft., probably steel frame and siding, Butler St. **Maturity soon.**

CONTRACTS AWARDED

Mass., Quincy—SHOP—Louis Epstein Radiator Repairing & Plating Co., 138 Washington St., 1 story, wing, brick, stone repair shop and office, concrete found., Washington St., to W. L. Lofgren, 19 Cottage St. Est. $40,000.

O., Cleveland—MACHINE SHOP and STORAGE — H. M. Morse & Co., archts., 750 Prospect Ave., 1 and 2 story, 120 x 156 ft., brick, steel, to Wm. Dunbar Co., 8201 Cedar Ave., for Strong, Carlisle, Hammond Co., L. J. Hammond, pres., 1394 West 3rd St. Est. $100,000. Noted May 7.

Ont., Thorold — MACHINE SHOP — Ontario Paper Co., Allanburg Rd. (controlled by Chicago Tribune, 435 North Michigan Ave., Chicago, Ill.), 2 story, 50 x 144 ft. brick, steel, to H. A. Wickett Co., 156 Front St., East Toronto.

POWER PLANTS

PROPOSED WORK

Ill., Chicago—Commonwealth Edison Co., 72 West Adams St., plans by Holabird & Root, 333 North Michigan Ave., substation on 40 x 179 ft. site, 11-15 North Wabash Ave.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, bids early in June, boiler plant, incl. boilers, coal and ash handling equipment, for Kings Co. Hospital.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids after June 15, general contract boiler house addition and stack at Welfare Island, opposite 67th St., K. M. Murchison and W. H. Gompert, 101 Park Ave., archts. Noted Apr. 9.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids early in June, boiler plant at Harlem Hospital, Lexington Ave. and 136th St. To exceed $40,000.

O., Cincinnati—See "Waterworks."

Ont., Sault Ste. Marie—Algoma Dist. Power Co., 527 Queen St. E., concrete, steel power house, installing hydro-electric power machinery, electric equipment and constructing dam on Montreal River, 90 mi. from here. $1,000,000 or more. Lang & Ross, 650 Queen St. E., engrs.

BIDS ASKED

N. Y., Beacon—May 29, by Commissioner Dpt. Correction, Albany, silicon carbide block and brick courses for boiler settings; circulating oiling systems; synchronizing equipment for generator engines; street lighting equipment at Matteawan State Hospital; adv. E. N.-R. May 21.

CONTRACTS AWARDED

Ind., Jasper—City Council, general contract steel, brick power plant, to R. Hochgesang, Jasper. Est. $40,000.

Ind., Plainfield—Indiana Boys School, general contract brick, steel boiler house, to F. M. Cooley, 5675 Winthrop St., Indianapolis. Est. $40,000.

Ind., West Lafayette (br. Lafayette)—Purdue University, general contract brick, steel power plant, to A. E. Kemmer, Lafayette; piping, to Johnson-Larson & Co., 6530 Beaubian St., Detroit, Mich. Est. $100,000. Noted May 19.

Mich., Wyandotte — City Comn., City Hall, furnishing, installing 2 water tube steam boilers, superheaters, air heaters, water cooled furnace walls, masonry settings, for new municipal boiler plant on Detroit River, to American Combustion Eng. Co., 1537 Book Bldg., Detroit, $87,480.

Que., Montreal—Royal Victoria Hospital, 71 x 106 ft. power house, University St., also chimney, to Atwood Ltd., 1119 University St.

WAREHOUSES

PROPOSED WORK

Calif., Oakland—Oakland City Port Comn., 424 Oakland Bank Bldg., sketches superstructure 2 story, 210 x 280 ft. warehouse, Outer Harbor Terminal. $250,000. Eng. Dpt. of Owner, engrs.

Ill., East St. Louis — Illinois Central R.R. Co., 135 East 11th Pl., Chicago, Ill., A. F. Blaess, ch. engr., soon takes bids 1 and 2 story, 100 x 800 ft., rein.-con., brick freight depot, Front St. $300,000. D. F. McLaughlin, c/o owner, archt. F. R. Judd, 700 Dowie Bldg., Chicago, engr. This corrects report in May 7 issue.

Kan., Colby—Syms-Shafer Grocery Co., soon lets contract 1 and 2 story, basement, 60 x 237 ft., brick, steel, tile cold storage plant, $45,000. B. H. Byrnes, 312 Natl. Bank of America Bldg., Salina, archt. Noted May 14.

Mass., Worcester — Northeastern Storage & Distributing Co., J. S. Gerety, 93 Grafton St., plans by F. B. Hoffman, 147 East 51st St., New York, and takes bids probably late in June, 180 x 640 ft., brick, steel, concrete storage warehouse terminal, Artic, Grafton and Keefe Sts. $900,000. Noted Oct. 23.

BIDS ASKED

N. Y., Dannemora—May 29, by Dpt. Correction, Albany, structural steel work for industrial storehouse, at Clinton Prison; adv. E. N.-R. May 21.

N. Y., New York—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Watsonville — Fruit Growers Cold Storage Co., 16 Wall St., 1 story, 280,000 box capacity, rein.-con. cold storage plant, Salinas Rd., to P. T. Wallstrum, 217 Center St., $180,000.

Mass., Cambridge—Metropolitan Ice Co., 321 Washington St., Somerville, 1 story, basement, irregular sized, brick, concrete storehouse, filling station, concrete found., to E. D. Ward Co., 82 Foster St., Worcester. Est. $40,000. Noted Apr. 30.

N. Y., Bedford Hills—Dpt. Correction, State Office Bldg., Albany, general contract cold storage, bakery, employees home, at New York State Reformatory, to Cross & Roberts, 122 East 42nd St., New York, $330,000; heating, to Bareham & McFarland, 136 North St., Rochester, $18,133; sanitary work, to J. Winkel, Larchmont, $28,098; electrical work, to Electric Eng. Co., 405 Lexington Ave., New York, $13,890. Grand total $390,101. Noted Mar. 5.

N. Y., Buffalo—Nickel Plate Development Co., Terminal Tower, Cleveland, 2 story, brick, steel, rein.-con. terminal warehouse, to Cowper Co., Rand Bldg. Est. $300,000.

N. Y., New York—Corporation, c/o I. Braunstein, 4756 3rd Ave., 1 story, 100 x 100 ft. storage and light manufacturing building, Halleck St., separate contracts. $40,000. R. Gottlieb, 475 3rd Ave., archt.

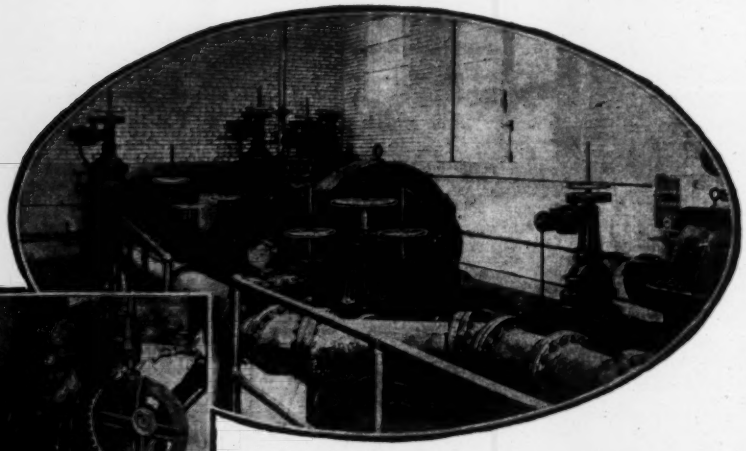
N. Y., New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., foundation for freight station, Spring St., to P. T. Cox, 154 Nassau St., $2,267,899.

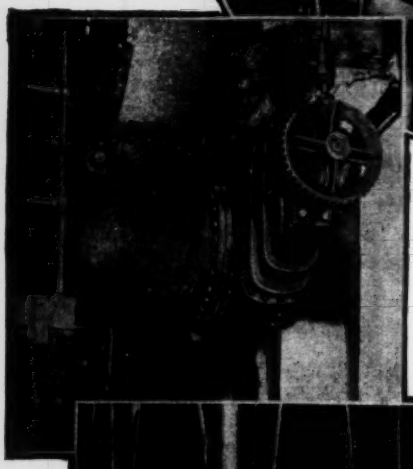
N. Y., New York—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., cold storage warehouse, railroad viaduct, to Aronberg-Fried Co., 21 East 40th St., $509,227. Noted Apr. 9.

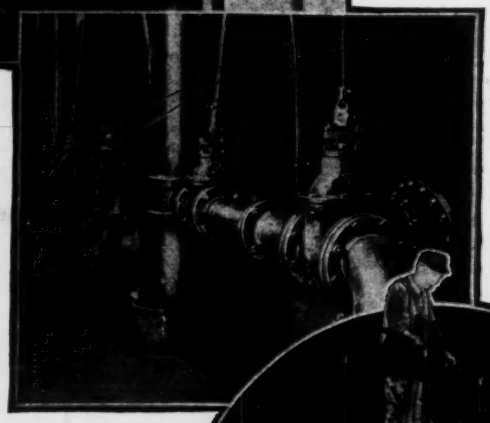
Que., Montreal—T. J. Eaton Co. Ltd., 16 x 45 ft., steel, brick warehouse, Fullum St., to Anglin-Norcross Ltd., 892 Sherbrooke St. W., $48,000.

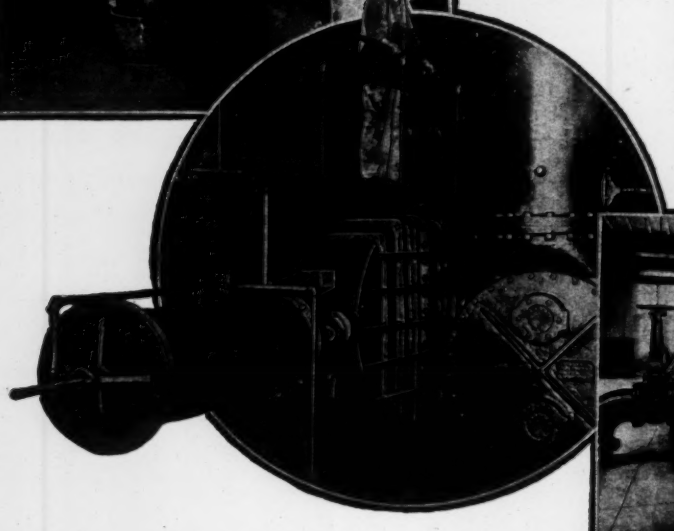
See proposal advertising on page 152

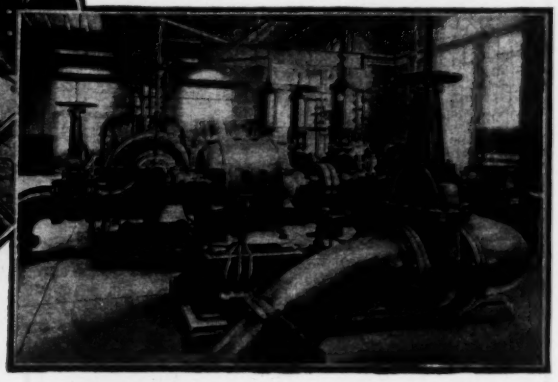
Constr. News page 227











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